Towards ICT-enhanced Teaching and Learning in Inclusive Schools: a rudimentary study in Johannesburg Central District

by

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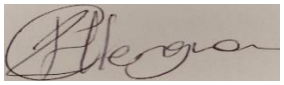
DECLARATION

I, Charlotte Lungile Hlengwa declare that "**TOWARDS ICT-ENHANCED TEACHING AND LEARNING IN INCLUSIVE SCHOOLS: A RUDIMENTARY STUDY IN JOHANNESBURG CENTRAL DISTRICT**" is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of a complete list of references.



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ABSTRACT

The study explored how factors related to Information and Communication Technologies (ICT) contribute to ICT-enhanced teaching and learning in Inclusive Schools in the Johannesburg Central District. The factors included school ICT policy, ICT infrastructure, teacher ICT perceptions, ICT community support and teacher professional development. Inclusive schools cater for a diverse learner population, which includes learners with special needs and those with learning barriers. Inclusive education, as an ongoing and progressive education system, demands dynamic learning environments that promote access to education for all types of learners. ICT-enhanced teaching and learning is seen as a catalyst for facilitating inclusive pedagogical practice that promotes thriving inclusive schools.

The study employed a quantitative research methodology, using a case study and survey research design by administering a questionnaire to 78 teachers; a semi-structured questionnaire to four principals and document analysis in the four Inclusive Schools in the Johannesburg Central District. Document analysis of school ICT policy was conducted to provide triangulation for the questionnaire results.

The study found that Inclusive Schools within Johannesburg Central District suffered from school-level barriers as there is a scarcity of ICT infrastructure that is fit for use in ICT-enhanced teaching and learning. School ICT policy is not adequate to drive ICT-enhanced teaching and learning in Inclusive Schools. There is a dire need to assist Inclusive Schools with the development of school ICT policy that implements the national e-Education policy in their schools. Lack of ICT infrastructure, security and theft are major barriers to ICT Community Support. National policy mandates school ICT resources to be utilised to support the community to extend learning beyond normal school hours yet principals are of the view that only Saturdays and school holidays can be accessible times.

Perhaps this is a start, but it limits learners who need support on a daily basis while adhering to the syllabus. Teachers at Inclusive Schools need Continued Professional Development in ICT. Teachers' demographic factors of age, gender and teaching experience had no influence on ICT-enhanced teaching and learning when mediated by their perceptions. Teachers' qualifications influence perceptions of their own competence in using ICT. This is very useful as teachers of all ages, gender, experience and qualification have similar positive views on ICT use in Inclusive Education, which is positive for inclusive schools to integrate technology in

their schools. However, teacher competence also differed from one school to another; and the current role of teachers impacted on the level of perceived benefit of ICT devices in teaching in inclusive environments. In practice, ICT-enhanced teaching and learning in Inclusive Schools is at a very low level due to barriers of inadequate ICT infrastructure; inadequate school ICT policy; minimal teacher ICT professional development; a lack of community ICT support; theft of ICT; compromised school security and lack of sustainable ICT funding.

Keywords: ICT-enhanced teaching and learning, ICT community support, inclusive schools, school ICT policy, teacher ICT perceptions, ICT professional development, ICT theft, school and ICT security, ICT funding model

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TABLE OF CONTENTS

APPENDICES

PUBLICATIONS

Hlengwa, C.L., Chimbo, B. & Buckley, S. (2018) Impact of teacher demographic factors on perceptions of ICT-enhanced teaching and learning in Inclusive Schools: Johannesburg Central District, South Africa. *Proceedings of the 10th Conference of the International Development Informatics Association (IDIA 2018*), *23-24 August 2018, Tshwane, South Africa.*

LIST OF FIGURES

LIST OF TABLES

Abbreviation List/ Acronyms

DOE – Department of Education

DBE- Department of Basic Education

EENET- Enabling Education Network

GDE- Gauteng Department of Education

MEC – Member of Executive Community

NEPAD- New Partnership for Africa's Development

SMT – School Management Team

SGB – School Governing Body

UNESCO- United Nations Educational Scientific and Cultural Organisation

CHAPTER 1:

INTRODUCTION AND BACKGROUND TO THIS STUDY

1.0 Background of the study

Our world is changing and central to this change are Information and Communication Technologies (ICTs). From studies that synthesise the role of ICT in education and development, it was found that various collaborative international development initiatives, including the field of education have focused on ICT to provide innovative responses to developmental challenges experienced (GIZ Science to Policy Brief, 2016; Makhari, 2016; Ngqondi & Mauwa, 2019). Since the dawn of the democracy of the Republic of South Africa, transforming learning and teaching through ICTs has been a very bold vision from the national Department of Education (DoE). This vision culminated in the policy White Paper: e-Education (2004). The DoE made enormous investments by providing computers and establishing relevant policies to provide an environment where learners with varying abilities and the community could access various technological services for educational, personal and community development (White Paper: e-Education 2004). Parallel to these ICT-related educational developments was the move towards an inclusive provision of education where all types of learners can learn in the same settings (Dube, 2020; Koranteng, 2020; Efthymiou, & Kington, 2017).

Providing Inclusive Education is seen as a bold step that adopts the goal of the United Nations (UN) Convention on the Rights of Persons with Disabilities to promote full participation of learners with disabilities in Inclusive Schools (Hayes & Bulat, 2017). The UN Convention on the Rights of Persons with Disabilities made an assertion on questions that should be asked by professionals providing service to people with disabilities. They asserted that these questions should take caution against defending the question of "*should services be provided"* but rather focus on ***how better can service be delivered, with what materials, and in what setting*** (Inclusion for All: UN Convention on the Rights of Persons with Disabilities 2012, p4). This UN stance is compelling and deserves appropriate action for the promotion of inclusive learning. Therefore, inclusive learning environments encourage learners with various medical, cognitive, physical barriers to have equitable education because such learners were previously secluded in Special Schools but now the door has been opened for them to thrive in Inclusive Educational settings (Dalton, Mckenzie & Kahonde, 2012). Therefore, e-Education should be

available to facilitate this bold vision of equitable education through inclusive schooling (Sita Rama Krishna Rao, 2016). In addition, e-Education strives towards an integrated ICT environment to benefit teaching and learning of all types of learners (Ghavifekr & Rosdy, 2015).

This study serves as a platform to begin to address the questions posited by the UN Convention on the Rights of Persons with Disabilities (2012) on ***how better service can be delivered, with what materials and in what setting***. Addressing these questions contributes to the attainment of equitable education for all types of learners in their preferred learning institutions. There is a high degree of expectancy in inclusive environments for novel teaching practices that will benefit previously marginalised learners. Can these current inclusive environments deliver on these high expectations through ICT-enhanced teaching and learning?

1.1 Inclusion and Inclusive education

In 1994, in Salamanca, Spain, representatives of 92 governments and 25 international organisations met to deliberate on the issues of Inclusive Education (United Nations Educational, Scientific and Cultural Organisation (UNESCO), 1994). An outcome of this meeting was the issuing of a policy statement called the Salamanca Statement. This statement pioneered the usage of the terms “inclusion” and “Inclusive Education” in the domain of government. The view was that countries should focus their efforts on developing Inclusive Schools that cater for all types of learners and that this approach is rights-based (“The Salamanca Statement and Framework for action on Special Needs Education," UNESCO 1994). It is therefore essential to establish mechanisms that promote, facilitate and ‘secure’ an Inclusive Education. It is crucial that the concept of inclusive practice in school environments be established. ICT-enhanced teaching and learning is one of the greatest mechanisms that can create conducive inclusive environments.

There are obligations that require attention for schools to move towards an inclusive environment. Understanding what Inclusive Education entails will enable Inclusive Schools to shape their educational provision so that all types of learners can benefit. **Vital *descriptive elements*** for Inclusive Education, (among others, are:

- a persistently progressive process of change and improvement;
- reorganization of education cultures, policies and practices;

- changing the thinking within the education system;
- identification and removal of identified barriers;
- solving attitude, practice, policy, environmental and resource barriers;
- process in which all stakeholders should participate; and
- can happen outside the formal education system) (EENET, 2018)

Against this background, e-Education is complementary to Inclusive Education. Teaching and learning that is ICT-enhanced can be a catalyst in enabling Inclusive Education to be shaped according to the descriptive elements mentioned above.

1.1.1 Inclusion in the South African context

Education for all, without limits in inclusive teaching and learning settings, is a bold vision and ideal of our education system in South Africa. Inclusive teaching and learning promote the idea that all learners are different like crayons but that they should be able to learn together in the same environment. These learning settings have prompted the Department of Education (DoE) of South Africa, to restructure the education system to address all learning types and learning needs of all learners. The primary step in this direction was to deal with the separate educational structures. Schools were previously categorised according to learner characteristics. Children with different abilities and disabilities were placed at certain schools (White Paper 6: Special Needs Education, 2010). This resulted in separate and different learning environments. The DoE firstly changed the learner categories and their school support as follows:

- Special schools accommodate learners requiring intense level of support (level 5). In these schools or learning sites, availability of support would be on a full-time basis. Previous special schools were reclassified as Learners with Special Education Needs (LSEN) schools and were to be possibly converted to Resource Centres as well (White Paper 6: Special Needs Education 2010).
- Full-service schools accommodate learners with less intense levels of support (level 4). These schools are mainstream or public schools that accommodate a certain number of learners, for example those who experience impaired mobility or who need specialised devices.
- Previous normal schools remained as mainstream schools but were earmarked to be converted to Inclusive Schools (60 % mainstream and 40% inclusive). Other learners needing less specialised support (levels 1-3 as well as level 4) can choose to attend these schools. District Based Support Teams (DBST) (White Paper 6: e-Education) will be

responsible for monitoring, planning support services within the schools (Reviews of National Policies for Education: South Africa, 2008).

- Levels 1-3 and 4 schools are referred to as ‘Full-service school’ and ‘Inclusive School’ interchangeably (Mfuthwana & Dreyer, 2018); but this research uses the term ‘Inclusive Schools’.

Children need to learn in these environments inclusively. The assumption is that better integrated learning can be fostered when all learners are housed in the same environments and offered the same education. These inclusive teaching and learning environments accommodate learners of all forms of abilities, disabilities and capabilities. Disabilities could pose barriers to learning. Some children could have barriers that are sensory, neurological, physical, or intellectual, which need to be addressed through pedagogical responses (White Paper 6: Special Needs Education, 2010). Therefore, Inclusive Educational settings are challenging educational environments as they cater for myriad of educational needs in one setting (Dreyer, 2008).

An Inclusive Education system is not only centred on integrating children with disabilities into the mainstream classrooms (Dreyer, 2017) but it is about personalising learning so that each may reach their full potential. Central to the achievement of this ambition is the utilisation of ICT in teaching and learning. However, it should be noted that ICT is not the panacea of education but rather an enabler. ICT supports and enables Inclusive Education by providing different instruction methods, innovative opportunities and flexible assessment methods for learners who may experience various barriers to learning (White Paper: e-Education 2004). ICT can be in the form of assistive technologies for learners with disabilities; Internet, laptops, mobile devices, interactive smartboards, desktop pc’s, and video equipment (Hove & Grobbelaar, 2020). ICT in schools can also be used for curriculum transformation, access to information and administrative processes. It is strongly assumed that through inclusion, general education will change to meet the child’s needs (UN Convention on the Rights of Persons with Disabilities, 2012, p23). Innovative educational structures are imperative to afford equal education for all types of learners. Therefore, ICT, as an enabler, plays a very crucial role in the attainment of equal education (Dlamini & Coleman, 2017).

1.2 ICT-enhanced teaching and learning (e-Education)

e-Education is about the utilisation of ICTs in education (teaching and learning). The DoE, now called the Department of Basic Education (DBE) has geared itself to promote e-Education. Through effective combinations of technology and pedagogy, e-Education will connect teachers and learners to better information, ideas and to one another (White Paper: e-Education, 2004). Successful integration of ICTs into teaching and learning is one of the pillars of e-Education. This pillar heightens meaningful interaction of learners with information and provides meaningful advancement of cognitive abilities (White Paper: e-Education, 2004). Computer-integrated learning provides another scaffold in the equipping of all learners for equitable participation in the knowledge-driven society before they leave for institutions of higher learning. Computer-integrated learning can be described as ICT-enhanced teaching and learning. Strategies; therefore, need to be looked at on how to increase ICTs impact for cost effective, quality and accessible education which when integrated will enhance learning and teaching processes (White Paper: e-Education, 2004).

Strategies addressing ICT shortages in South African schools are vital. International organisations including NEPAD (New Partnership for Africa's Development) has one of its goals to expand the provision of education in schools by promoting usage of the Internet and ICT applications (Farrell, Isaacs & Trucano, 2007). This goal indicates the vitality and extent of the drive to address educational demands through the implementation of technological resources.

e-Education as an inclusion tool

Education is a right that is enshrined in our constitution of the Republic of South Africa. This right is for everyone, those who experiencing disabilities and barriers and those who do not. A right to education is a right to e-Education. The United Nations Convention on the Rights of Persons with Disabilities (CRPD, 2006) stated that the use of ICT in education, at least for learners with learning disabilities, is currently one of the most important matters in the political spheres of different countries- mainly those that endorse and support the United Nations Convention on the Rights of Persons with Disabilities (ibid).

The DBE's thinking is that ICTs should be harnessed to leverage the offering of educational opportunities to all. There are different learning styles with individualised learning experiences which can be enabled by ICTs through extension of opportunities for learning (White Paper:

e-Education 2004). Removal of barriers is part of this course. Some of these barriers are disparities of the past, which come in diverse forms, not necessarily as one might immediately think along racial lines but also as unequal educational offerings for differently abled learners. Disparities of the past can be eradicated through the integrated use of ICTs. Integration does not only occur in the utilisation of tools in education but also in the integration of diverse learners in the same instructional settings through inclusion.

1.3 Motivation of the study

As much as research should be objective and free from the researcher's bias, the researcher believes that the researcher's worldview provides a platform from which the researcher draws reason for their cause - the motivation for the study. Having been exposed to teaching children that exhibited symptoms that are prevalent on the autism spectrum, the researcher felt a sense of helplessness when schools showed a lack of knowledge of such a condition and therefore showed also an indifference to make efforts for appropriate learning environments beneficial to such children. With mainstream schooling, it seemed easier to send a learner to a remedial school just for being a bit different, without understanding the deeper causes of behaviour. Perhaps the overwhelming realisation that not all learners can be assisted individually was daunting. When the researcher learnt of the conversion of mainstream schools to full-service schools, hope rose that there is a glimpse of light for many learners who could be accommodated near their area of residence and not feel ostracised for being different. As an information technology student and having been exposed to ideas of how ICT can assist people with disabilities, the researcher realised a need for an investigation into what is available at Inclusive Schools near her area of residence. The researcher wanted to learn how they can be assisted to move forward to an inclusive environment based on the use of ICT for teaching and learning.

1.4 Problem Statement

Inclusive Schools are learning environments that cater for all types of learners (Dreyer, 2017; Mfuthwana & Dreyer, 2018). The rhetoric around this form of education system is about overcoming learning barriers and fortifying development for all children (Reenen & Karusseit, 2017). Inclusive Schools have been endorsed and advocated by various specialist groups and international authorities like the UNESCO (2015; 2017). South Africa, as a developing country, has moved to embrace and implement this international educational trend of Inclusive Schools. Progressively, many mainstream schools were converted to Inclusive Schools where the

Inclusive Education system is implemented and should thrive (Mfhuthwana & Dreyer, 2018). Although there are different interpretations of what constitutes Inclusive Education (Ainscow, Booth & Dyson 2006), enquiries on the different contexts it is implemented in should be known because what remains is that education is a right that must be offered to all. Inclusive Schools remain teaching and learning environments where educational boundaries should constantly shift owing to their diverse learner cohorts (Hove & Grobbelaar, 2020). Therefore, how these environments thrive or should thrive is of paramount importance.

The government has geared itself to providing e-Education (using Information and Communication Technology to augment, advance, provide and enhance education). More importantly, e-Education can be viewed as an enabler to education (White Paper: e-Education 2004). Therefore, Inclusive Education can benefit tremendously from e-Education. Inclusive Schools are very demanding educational settings and can benefit from ICTs that are not merely stand-alone solutions or catalysts but rather tools with the potential to be blended with teaching, learning and administration of both (GIZ Science to Policy Brief 2016). ICTs can be used, among other things, to enhance teaching and learning, administration, curriculum management, pedagogy transformation, and teacher training (Hove & Grobbelaar, 2020). Against this background, e-Education should be realised for such learners to thrive under the current educational and technological settings in Inclusive Schools. ICTs have become the key ingredient in e-Education and one of the conduits to producing inclusive teaching and learning environments. ICTs need to address and support teaching and learning as well as provide platforms for critical administration support vital in Inclusive Schools. ICT integration in teaching and learning is critical for the realisation of e-Education and Inclusive Education goals. If the goal is to provide or achieve e-Education (ICT-enhanced teaching and learning) in Inclusive Schools that benefit all types of learners, it is vital that the factors that contribute to that attainment be investigated to understand what the current status is. Although these factors can take many different forms, it was envisaged that investigating and exploring these factors will provide an understanding of the level of ICT-enhanced teaching and learning in Inclusive Schools.

While Inclusive Education is implemented progressively at different levels and in different contexts (Booth & Ainscow 1998), it is critical that realities of practice be explored within these newest Inclusive Schools so that if there are any barriers, they can be dealt with and removed. Therefore, ICT-enhanced teaching and learning in Inclusive Schools should be

investigated so as to have contextual understanding and to explore existing opportunities (Miles & Singal, 2010; Dlamini & Coleman, 2017) for enhancing teaching and learning through ICT.

1.5 Purpose of the study

Various research has been conducted on - factors that contribute towards e-Education and e-learning. Mofarreh (2016) mentioned that the world identified the important role of (ICT) in improving education through curricula reform and the development of a set of national goals and policies to guide the implementation of ICT in schools. Strategies are being developed to support and promote the successful implementation of the Inclusive Education. Mathipa and Mukhari (2014, p1213) identified some factors that impeded on the integration of ICT in teaching and learning such: inadequate number of computers, lack of ICT skill and lack of confidence, teachers' beliefs, poor school leadership, lack of public support, insufficient teacher training, teacher generation gap. Khoza, Kekana & Dlamini (2019) found that e-Education has been constrained by time constraints issues, security, accessibility, willingness, infrastructure, access to continuous professional development and communication were experienced as constraints. Time constraints issues and accessibility can obstruct the idea Inclusive Education being a flexible system that allows teaching and learning not to be confined to educational traditional structures. Providing community access afterhours to schooling facilities like computers is an example of providing education outside the traditional formal schooling system. Mogwe and Balotlegi (2020) indicated a low rate of ICT utilisation, lack of basic ICT skills, lack of infrastructure amongst key barriers to e-Education.

The purpose of this study is to explore factors that contribute to the provision of ICT-enhanced teaching and learning (e-Education) to understand the extent of ICT-enhanced teaching and learning in Inclusive Schools within Johannesburg Central District. These factors can take various forms either being tangible or non-tangible, technical, cognitive, structural, demographic, and so forth. For the sake of this rudimentary enquiry, some of the factors have been chosen as a starting point for the exploration of this subject. The factors are:

- School ICT policy
- School ICT infrastructure;
- ICT Community support according to e-Education goals (White Paper: e-Education 2004);
- Educator ICT perceptions;

- Continued Professional Development in ICT; and
- Identified inadequacies (Kafyulilo, Fisser & Voogt, 2015; Vandeyar, 2015; Agbo, 2015; Koro, 2012)

A holistic and equitable educational provision should be tackled head-on. It is understood that education has three facets, namely, teaching, learning and the administration of both. According to Tpress (2014), there are layers of experience and influence that affect education - some of which are staff training and support, budget, teacher views and perceptions, educational infrastructure, national educational policy and international policy like UNESCO (The Salamanca Statement 1984.) These educational layers or factors provide paradigms that impact on the successful provision of teaching, learning and the administration of both. Therefore, these factors present some of the key elements that need to be considered when desiring to implement e-Education strategies. ICT strategies that represent the "e" of education in schools would also then be affected by these educational factors mentioned above. Any noble or strategic ICT intervention in Inclusive Education would at least be affected by these underlying factors. It is then necessary to investigate the extent that these factors are present in inclusive educational settings to improve and promote effective access to education for all types of learners. In essence, a sense of readiness to educate Special Needs education in mainstream education settings could be determined.

The new Department of Basic Education (DBE) postulates that commercial pressures and popular trends should not drive government's strategy for e-Education but rather sound research (DBE Research Agenda, September 2011). This study is a vehicle for sound research that could inform government's strategy for e-Education. This study aimed to explore factors that contribute to the provision of ICT-enhanced teaching and learning. According to the Gauteng Department of Education (GDE 2011), it is vital to enquire about the current ICT status in schools to be able to make decisions on how to best utilise what exists, what can and cannot be done with what exists and how to move forward to the next step (GDE, 2011).

There is a paucity of research focused on ICTs and Inclusive Education (GIZ Science to Policy Brief 2016, p6; Dlamini & Coleman, 2017). This study aimed to add to that body of knowledge and advance the cause for better understanding.

A rudimentary enquiry into ICT-related factors that contribute to Inclusive Schools achieving e-Education and Inclusive Education is necessary to benefit all types of learners. Moreover, Inclusive Schools need to cater for all types of learners. As alluded to earlier on what descriptive elements qualify what Inclusive Education should be, this exploration and examination of ICT-related factors therefore seeks to provide a panoramic view of the current status of Inclusive Schools. This examination also provides proven input to constructive decision-making that contributes towards the provision of ICT-enhanced teaching and learning for all types of learners.

1.6 Research Objectives

The objectives of this research are the following:

- To assess whether Inclusive Schools, in Johannesburg Central District, have ICT capability to support ICT-enhanced teaching and learning; the supportive maintenance structures that exist; and the extent of community access to that school ICT infrastructure for support and use after hours.
- To determine the availability and adequacy of inclusive school's ICT policies.
- To learn of teachers' ICT perceptions of using ICT in education, teaching, professional development and curriculum enhancement; and to explore the influence of educator demographics on their ICT perceptions.
- To learn of the status of the teachers' ICT professional development in these Inclusive Schools.
- To identify critical school inadequacies that need to be addressed to assist Inclusive Schools in moving towards an integrated ICT teaching and learning environment.

1.7 Research questions

The main research question for this study is:

To what extent are Inclusive Schools within Johannesburg Central District moving towards ICT-enhanced teaching and learning?

The following research sub-questions will assist in answering the main research question:

- How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning in Inclusive Schools?

- In Inclusive Schools, how is the current school ICT infrastructure being utilised, after hours, for community support for information access and training of learners with Special Needs?
- What is the status of school ICT policies that support ICT-enhanced teaching and learning?
- What are the perceptions of the teachers using ICT in education, teaching, professional development, and curriculum enhancement?
- Do teachers' demographics influence their ICT perceptions?
- What is the status of the teacher's ICT professional development?
- What are the inadequacies that need to be addressed to assist these Inclusive Schools in moving towards ICT-enhanced teaching and learning?

1.8 Significance of the research

ICT support in Inclusive Schools should aim at making teaching and learning possible to the benefit of all learners and teachers. The significance of this study is that the current state of ICT-enhanced teaching and learning in Inclusive Schools within Johannesburg Central District are made known. The schools can identify ICT infrastructure that may be required to support all types of learners and therefore make sound and practical future technological decisions. The DBE will be able to make decisions for further implementation of e-Education in Inclusive Schools. The schools and the DBE will be able to ascertain 'gaps' in current educational undertakings and be able to provide teacher support and training. Institutions of higher learning and the private sector can see where ICT professional development gaps for teachers in inclusive primary schools are. School ICT policy issues are highlighted so that Inclusive Schools can have strategic policies that speak to the implementation of Inclusive Education. Issues around the e-Education policy prerogative of using school ICT to support the community and families are exposed. There is an understanding of the critical demographic factors that may negatively influence teachers' ICT perceptions to implement strategies that are cognisant of these limitations or barriers.

1.9 Scope of study and delimitation

The study was conducted in the four inclusive primary schools that are in the Johannesburg Central District. These are the only schools that have been recently converted by the DBE (2012) to be Inclusive Schools. However, the DBE has only converted primary schools to be Inclusive Schools. ICTs in the schools were delimited to those that are commonly available

and can be accessed and utilised by learners such as Internet, desktops, interactive smartboards, laptops, tablets, and mobile devices.

1.10 Layout of the Dissertation

Chapter 1: 1. Introduction and Overview – the study is introduced, including the background and motivation. The research problem is given, including the approach used to comprehend the problem. Research questions- the main question and its sub-questions, objectives of the study and its significance, the scope and delimitations are all presented sequentially.
Chapter 2: Literature Review – delves into literature to understand and bring out all dimensions of the research problem. Key factors as outlined in Chapter 1 are covered in depth.

Chapter 3: Research Design and Methodology – describes the approach taken to conduct the study including the how data was collected, presented and analysed.

Chapter 4: Analysis of the results – focuses on the interpretation of the data.

Chapter 5: Discussion of the findings – research results are discussed to answer the research questions and literature is used to anchor the findings

Chapter 6: Summary and recommendations – findings are summarised, conclusions are drawn, recommendations are provided, and future research direction specified.

1.11 Summary

Chapter 1 discussed the background of the study and the problem statement. The research gap had been identified. The purpose of the study and its objectives were also elaborated on. The research questions were defined including the description of the significance of the study. Chapter 1 also expanded on the delineations and the limitations of the study. Chapter 2 focuses on the literature review which is the theoretical anchor of the study.

CHAPTER 2:

LITERATURE REVIEW

2.0 Introduction

The literature review acquaints the researcher with the discourse in the area of interest, assists in identifying a research problem therefore providing proof for relevance of the proposed study (Creswell, 2014). In the following sections of this chapter, the literature review lays out the trail of review undertaken to understand and "place" the research problem. The issues under exploration in this study are unpacked. Firstly, the researcher will inform of the key drivers for this research, will outline the role of ICT in education, inform of the forms of ICT support in Inclusive Education, unpack ICT-enhanced teaching and learning and the barriers that affect it, and lastly, review literature that focuses on the factors under exploration in this study.

2.1 Inclusive education

In the pursuit to understand what Inclusive Education is, Enabling Education Network (EENET, 2018), a trusted voice in Inclusive Education matters, posits that Inclusive Education should be defined in terms of "what it is and what it is not" as depicted in Figure 2.1 below. Understanding the nuances in this spectrum assists in assessment of practice, future planning and continuous evaluation of desired goals and aims of Inclusive Education (Slee, 2018).

From the summary tabulated below in Figure 2.1 (EENET 2018: p1) and the DBE's (Guidelines: Full-service and Inclusive Education 2010; Slee, 2018a), I learn that Inclusive Education is constantly evolving through change and improvement; a restructuring of the education system; identification and removal of barriers; addressing attitude and practice issues; a multi-stakeholder affair; and not confined to classroom spaces only. Based on these characteristics, research can be used to enlighten stakeholders on the identification of the current status of Inclusive Schools (Ainscow and Sandhill, 2010). Inadequacies, barriers and limitations that are negative to the successful implementation of Inclusive Education need to be put under the lens to be identified and strategically dealt with according to point 4 (**identify and remove barriers**) in Figure 2.1.

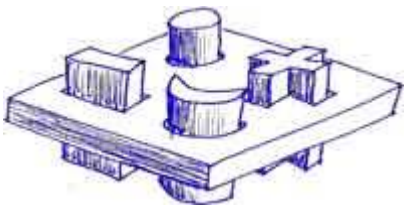
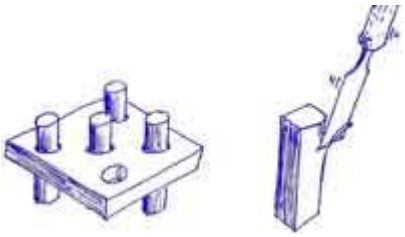
Inclusive Education is ...	Inclusive Education is not ...
1) ...**a constantly evolving process of change and improvement** within schools and the wider education system to make education more welcoming, learner-friendly, and beneficial for a wide range of people	...a once-off project that can be delivered and completed within a short timeframe
2) ...about **restructuring education cultures, policies and practices** so that they can respond to a diverse range of learners – male and female; disabled and non-disabled; from different ethnic, language, religious or financial backgrounds; of different ages; and facing different health, migration, refugee or other vulnerability challenges	...focused just on developing education for disabled learners within mainstream settings
3) ...about **changing the education system** so that it is flexible enough to accommodate any learner 	...about trying to change the learner so that he/she can fit more conveniently into an unchanged education system 
4) ...an ongoing effort to **identify and remove barriers** that exclude learners within each unique situation	...based on following a set formula of actions that can be used in any situation
5) ...about identifying and removing barriers to learners' **presence** in (access to) education, **participation** in the learning process, and academic and social **achievement**	...focused just on helping learners to gain access to schools or classrooms
6) ...focused on solving **attitude, practice, policy, environmental** and **resource** barriers	...just about overcoming financial and environmental challenges
7) ...a **process in which all stakeholders should participate** (teachers, learners, parents, community members, government policy-makers, local leaders, NGOs, etc.)	...a project that can be implemented solely by external experts or education officials
8) ...something that **can happen outside the formal education system**, as well as in formal school environments (Inclusive Education can happen in learning spaces that are non-formal, alternative, community-based, etc.; with learners from young children through to elderly adults)	...just a process that happens in formal schools

Figure 2.1 EENET definition of Inclusive Education (EENET 2018: p.1)

The goal or aim of Inclusive Education is an understanding that all persons with disabilities and without disabilities can access education on an equal basis in the communities in which they live according to point eight (**can happen outside the formal education system**) in Figure 2.1. Therefore, Inclusive Education is a flexible system that allows teaching and learning not to be confined to traditional educational structures. Providing community access afterhours to schooling facilities like computers is an example of providing education outside the formal system.

The right to basic education is a very important section of the Bill of Rights. Therefore, its implementation should not be subject to resource availability but has to be implemented immediately (Murungi, 2015). Yet, the Constitutional Court has used the reasonableness approach to determine the elementary core of rights. In this instance, the Court asserts that even though basic education is a right, it ought to be interpreted according to the ability of the state to pay for it (Murungi, 2015) i.e. have the means and resources. Therefore, this study should look at resources that are necessary to provide that basic education in Inclusive Schools according to point six (**focusing on solving attitude, practice, policy, environmental and resource barriers**) in Figure 2.1. UNESCO World Declaration on Education for All (1990; 2000; 2015) recognises that primary education is the pivotal delivery mechanism for basic education. This study, as a rudimentary investigation on ICT-enhanced teaching and learning, focused on inclusive primary schools as they are practice-rich environments for basic education. The ideal to provide basic Inclusive Education is challenged by that there seems to be a scarcity of useful resources in this field that enable the translation for policy makers of "what is known to work; and not work". This knowledge should assist in measuring achievement of Inclusive Education goals at national level in South Africa. A knowledge base of ICT in inclusive settings should be built up to produce strategic ICT investments and provide translation for policy makers. This will result in the attainment of Inclusive Education goals that can be measured and comparable in future.

In the South African context though, the duty is to ensure that Inclusive Education becomes a progressive realisation as asserted in point one that "**it is not a once-off project**" in Figure 2.1. White Paper 6: Special Needs Education (2010) elaborates on an inclusive model that takes into cognisance the paucity and severe resource constraints that primary education is facilitated in South Africa. However, the inclusive model was flexible to recognise that learning is not confined to formal schooling so as to maximise opportunities for teaching and learning for all

as in point eight (**restructuring education cultures, policies and practices)** in Figure 2.1. Therefore, restructuring in resource constrained environments should encourage innovative teaching and learning cultures, policies and practices. Contextual economic realities deem it necessary to take a progressive approach in the realisation of education for all. This approach contributes to the funding strategies and inadequate budgetary structures that are used within resource constrained schooling environments (Murungi, 2015). As primary education is the crucial delivery mechanism for inclusive basic education, national, local and school levels should exert considerable effort to formulate, shape and implement the Inclusive Education policy while recognising the paucity of resources. (Clark, Dyson, Milward & Robson, 1999; Lindle 2019) enlighten on the 'micro-politics of the school' that played a role in shaping debates of different stakeholders within the school that shape school-level policy and practice. Restructuring school-level policies plays a very substantial role in informing grass-root practice of Inclusive Schools, which would contribute to restructuring of educational cultures.

Multi-stakeholders have an interest in the success of the Inclusive Education, including teachers, communities, families, and the government as in point seven **(process in which all stakeholders should participate)**. Integration of all types of learners under one education system requires teachers or educators to have the requisite training that is flexible to enable responsiveness to the diverse learner community; and tools and resources to assist in this regard. Parents, families and the community need to participate in the education of their children. Nevertheless, their participation may at times contribute to the strain because of their 'phenomenal expectations' but not considering the inadequate school's resources that are at their disposal. Schools should remember that systems in which they operate are entrenched products of communities and families that live there (Ferguson, 2008; Cater & Abawi, 2018). Therefore, all stakeholders should participate to the success of Inclusive Education.

South Africa has made some strides in the implementation of Inclusive Education but is still trailing behind other countries that have had years of theoretical and practical experiences. Because South Africa has a unique educational, historical and socio-economic context, local research and response are required. Promotion of inclusive teaching and learning practices at country-level depends on the clear understanding of what 'Inclusive Education for all' is in the cultural space it is being developed. School-wide level, classroom-level and learner-level support is critical for learners with barriers to thrive. The need for research is to increase strategies that Inclusive Schools and teachers can use to ensure teaching and learning needs are

met (Walton et al., 2009; Makhalemele and Nel, 2016). “Developing local understandings of the complex of ‘education’, ‘all’ and ‘inclusion’ is critical to the development of appropriate policies on teaching and learning” (Miles & Singal, 2010) and the appropriate contextually sustainable strategies that facilitate that ideal (UNESCO, 2017). This research wishes to contribute to this body of knowledge. Significant focus of international research is on strategies that promote adaptations to teaching, learning and assessments. However, in South Africa, we are at the preliminary stage of understanding the current status of Inclusive Education and identifying the barriers that need to be addressed to move towards that ideal of education for all in an inclusive environment. As demands placed on school resources are very high, which increases the school’s inadequacy in meeting those demands (Clark, Dyson, Milward & Robson, 1999; Makhalemele and Nel, 2016).

2.2 ICT in education (e-Education)

ICT use in teaching and learning has many justifications, motivations and rationales. (Hawkridge, Jawoski & McMohan, 1990; Carter & Abawi, 2018) posit these rationales for e-Education as social, vocational, pedagogical and catalytic. Pedagogical rationales view ICT as undertaking the role of facilitator of teaching and learning. More importantly, ICT is also a catalyst for transformation of the education system by providing access to opportunities for individualised learning and by shaping relationships between teacher and learner (Hove & Grobbelaar, 2020). ICTs assist in contributing to the shift from traditional didactic teacher-directed or teacher-centric format of teaching to a more learner-centred individualised teaching and learning (Ferguson, 2008; Ratheeswari, 2018).

e-Education overarches three strands in its implementation, as:

a) learning for technology where technology literacy is the aim
b) learning with technology where technology facilitates learning for example assistive technologies
c) learning from technology where technological skills are integrated with curriculum applications

According to (Trucano, 2005; Hove & Grobbelaar, 2020), ICT usage in schools can also be for pedagogy transformation, for example, drill and practice; for accessing information and knowledge. ICTs are also used in communication and administration areas within school environments. Continued professional development of teachers is another ICT application area

in the school environment. According to Trucano (2005), varied studies have been conducted on the benefits of ICT in teaching and learning. Nevertheless, the impact of ICT use on student achievement remains difficult to measure and open to much reasonable debate. Goals such as student attainment of outcomes will depend on decisions on the type, blend of ICT and the degree or level of desired use.

There are various types of information and communication technologies (ICT), for example, personal computers, mobile gadgets, internet, radio, TV etc. These technologies may be utilised for providing or accomplishing demonstrative or presentation tasks. However, infusion or blending with teaching and learning is the desired step in education provision (Hove & Grobbelaar, 2020). Mobile devices such as iPads, iPods, laptops, desktops, interactive whiteboards, communication, learning, and education management software have been used in classrooms where technology has begun to take a prominent role (Al-Zu'bi, Omar-Fauzee & Kaur, 2017; Al-Zu'bi, 2020). The Internet and mobile technologies have also played a critical role in teacher's instant access to, for example, current school data (Ibieta et al., 2017).

ICTs have been used to support the teaching and learning of Special Needs learners (PGCE, n.d., p1). Waichigo (2013) cited by Luckasson and Schalok (2012) argue that these tools support to increase the competencies of the educational environment to improve the learners' ability to function and achieve desired learning outcomes. Researchers sum up, using the various supporting ICT types as: assistive, augmentative, remedial and diagnostic technologies, Inclusive Schools would benefit from these as their educational environments cater for all types of learners with various needs (Ferguson, 2008; Waichigo, 2013; Al-Dababneh & Al-Zboon, 2020). Special needs learners deserve Inclusive Schools that are equipped with appropriate ICT to enable teaching and learning that is suitable for the provision of their basic education.

ICTs do also provide certain benefits to education with regards to school management. Generally, ICTs can make the school run more efficiently and different role players, including administrative staff, educators, principals, and learners, in the school environment may obtain benefits from the current technologies (Oyedemi, 2015; Dlamini & Mbatha, 2018) Teachers can also benefit from the use of ICTs as they can facilitate sharing of resources, expertise and advice and greater flexibility for planning or preparation of learning materials. Learners of all abilities can develop new learning experiences thereby having more control over their learning experiences. Learners can also be motivated to use computers outside of school hours. If there

is continuous use of them during class time, this would contribute to extended teaching and learning (UNESCO, 2005).

Smits (2013: p.5) through his study, summarised the roles or rationales of ICT in education as given in Table 2.1 below. These rationales propel ICT use in education to evolve from a 'nice to have' to a very critical and strategic part in the provision of equitable education for all.

Table 2.1 ICT in education: rationales and explanations (Smits 2013: p.5)

Rationale	Explanation
Preparative	ICT is used to equip students with required skills for their future social and vocational functions
Pedagogical	ICT is used to improve student learning, understanding and retention
Catalytical	ICT is used to improve student learning, understanding and retention
Accessibility	ICT is used to equalize access to education unbound of time and location from the needs of every student
Motivational	ICT is used to motivate students to engage in learning activities
Administrative	ICT is used to monitor students and manage educational organisational processes and components

As planning for ICT infrastructure is one of the key processes in any organisation, planning for ICT use in schools is then a strategic process. Inclusive school's goals and targets need to be understood so that optimal infrastructure planning may take place. Ultimately, ICTs seem to be an investment for which Inclusive Schools must seriously consider and plan. An inquiry into the availability of ICT resources and how they are used in Inclusive Schools is therefore necessary. This study should enquire on this matter.

2.3 ICT support and interventions in Inclusive Education

Education 2030 Framework for Action advocates the need for appropriate ICT to play a substantial role in fostering education for all, integrate pupils with special needs, and attend to adequate teacher training (GIZ Science to Policy Brief, 2016). It is important to understand how ICT can be further used to provide and support Inclusive Education. ICT tools and support for Inclusive Education needs to be flexible and adaptable. ICT interventions in Inclusive Education have been implemented to assist in providing education to many learners - both in the global, regional and South African context.

Global perspective

Current practice does indicate that ICT use in supporting teaching and learning is well established. According to Learning2Go (2009), the Mobile Learning Network (Molenet) has co-ordinated 104 projects across 37 schools in the UK. The Project provided and implemented over 1500 portable devices for use across 18 schools. Schools have also shown curiosity in the use of modern mobile technologies, for example, game-based console tablets (Learner 2011; Dodson, 2010) in Yang and Wang (2013). In the same vein, Learning on Foot (Lopendleren n.d.) and Learnosity (Learnosity n.d.) projects in the Netherlands and Ireland respectively also showcase the usage of technologies in learning. Software programmes like SMARTeacher and ClaroRead for learning disabilities that build cognitive and language skills can also play a role in teaching and learning (Microlink 2018; Google Play Store 2018). Therefore, there are a myriad of technological interventions that have been used to leverage educational environments in Inclusive Education. Technologies such as iPads seem to be a valuable aid for children with special needs (Apple, 2021) within inclusive environments. However, this interest has not absolutely concretised the evidence of the impacts of these technologies on teaching and learning.

Large corporations like Apple (2021) are among other international organisations that have developed tools that could propel the advancement and accessibility of education within and without the classroom. Most of these tools leverage the ability for education to be provided on mobile platforms (Apple, 2021), which promotes flexibility that is highly essential in inclusive learning environments. According to this website, various schools have realised the value of mobile technologies to enhance learning because learners can take control of their learning, break barriers, boost the learning experience, transform attitudes and learner behaviour - although the real impact on the learning has not been quantified. It seems that utilising ICTs expediently could elevate learner independence and provide individualised support that is fundamental in Inclusive Education. The European Development Agency for Special Needs Education (European Agency 2018) citing Reiser (2012) highlights the work in Canada of a multidisciplinary team that has been using a technology-supported approach to inclusive learning using interactive whiteboards. Interactive whiteboards have risen in popularity as a teaching and learning tool in Inclusive Schools. Do our Inclusive Schools have these popular ICT tools such as iPads and interactive whiteboards?

Regional perspective

NEPAD e-Schools Initiative is a project aimed at providing ICT infrastructure in Africa to attain socio-economic development. This initiative aims to promote the teaching of ICT skills to both primary and secondary school going Africans and to also use the Internet and ICT applications to increase the provision of education in schools (Farrell, Isaacs and Trucano, 2007). NEPAD aims to equip "more than 555,000 African schools with ICTs and connect them to the Internet by 2020" (Isaacs, 2007). There could be large investments that are in the pipeline to improve technology access in schools; but their true value would be in their utilisation in teaching and learning.

According to www.Allafrica.com, Section 1 of Article 26 of the Universal Declaration of Rights articulates that "everyone has the right to education", including all individuals who are blind, deaf or living with a disability. Also mentioned on this website is the stance that the Nigerian Ministry of Education (NME) has made efforts in assisting all learners with varied abilities and disabilities to access education despite ICTs in use having been found to be expensive because of the specialisation of the learners' conditions.

South African perspective

International inclusive practice affords a useful framework for the examination of inclusive practice in South African (Walton et al., 2009). Inclusive education is facilitated through making all ordinary schools to Full-service/Inclusive Schools. South Africa has seen and experienced quite an explosion in ICT implementation projects. International organisations such as UNESCO, private sector and NGO's have made varied contributions in the drive to provide platforms for the provision of education for all. Vodacom, one of South African mobile service providers, for example has partnered with the DBE to launch ICT Resource Centres. These centres are expected to provide up to 1 400 teachers in the district areas with better access to quality instruction resources and ICTs (Digitalclassroom 2015). Such initiatives are indicative of the rigorous drive to use technologies to promote improved offering of education. Vodacom also has initiatives that introduced computer labs in schools.

Tablets have seen an increase in usage in schools owing to their mobility and portability features (Habler, Major & Hennessy, 2015; Major, Habler & Hennessy, 2017). Schools introducing tablets in teaching and learning are advised to allow teachers to have familiarity with the device capabilities so that their efficacy may be built; only a small number of tablets

be introduced per classroom for group-work; 'bring your own device' model be considered to encourage usage of personal devices that could lie idle at home (PDST Technology in Education, 2015).

From the above examples of ICT use in Inclusive Education, it was evident that there is a strong thrust of ICT use in the provision of education. The challenges that could emerge though are the cost of acquiring and maintaining (Hove & Grobbelaar, 2020) these technologies as evidenced by the pivotal role played by the private sector. Who is maintaining the ICT resources in our Inclusive Schools?

2.4 ICT-enhanced teaching and learning

ICT-enhanced teaching and learning is computer-integrated learning. Thinking rationally about the role of integrated learning systems may contribute towards a meaningful reconsideration of ICT use in education. One message more frequently debated in the integrated learning systems research (Powell, Aeby & Carpenter-Aeby, 2003) is an indication that not only does success with integrated learning systems relate to the teacher's educational approach, it also relates to how pupils are able to use the resource appropriately through self-direction (Cox et al., 2003:p.10). Hove and Grobbelaar (2020) found that to transform a learning environment to be learner-centred, there needs to be a harmonious mix between teacher training and support; and the use of the Internet and computer related technologies. ICTs offer an assortment of powerful tools that may help in realising this ideal to convert text-bound and teacher-centred classroom environments into interactive and collaborative knowledge environments.

It is important to separate the use of technology for recreational activities like playing games and instruction. Technology use in the teaching and learning needs to be better defined; for example, having a computer in the classroom and in the school for playing games (Bielefeldt, 2012) does not constitute ICT-enhanced teaching and learning. When a teacher uses technology for word processing only, that may not constitute ICT-enhanced teaching. Therefore, computer use does not necessarily equate to ICT-enhanced teaching and learning or cannot be viewed as technology integration.

With the above conditions practiced or in place, it is believed that e-Education goals may be realised. Any functioning environment will come across barriers that offer impediments to the

successful delivery of its mandate. ICT-enhanced teaching and learning is vital if schools are to harness the benefits of technology to assist learners with learning barriers.

2.4.1 Barriers to ICT-enhanced teaching and learning

ICT-enhanced education can be realised but there are barriers that inhibit its successful uptake. These barriers may in themselves be opportunities for refinement in implementation, integration and improvement. Scheurmann and Pedro (2009) cited by Waichigo (2013) and Donohue and Bornman (2014) suggest three categories that these barriers can be segmented into, namely, school-level, teacher-level and system-level:

- **School level barriers:** Good quality ICT infrastructure, hardware or software and Internet, is key in any technology-led environment (Johnson et al., 2016). No infrastructure or poor-quality infrastructure, lack of maintenance and upgrade of ICT is detrimental to an effective environment. In Sharpe's (2010) study, teachers experienced attrition in using assisting technology in teaching and learning owing to outdated and broken devices.
- **Teacher-level barriers:** As teachers play a central role in teaching, inadequate ICT skills and insufficient training and teacher support lead to barriers. According to Donohue & Bornman (2014), successful implementation of any new teaching and learning strategy rests on the school leadership and other school personnel who create a culture and have an ability to challenge or support the change. Current teacher education has produced teachers equipped with the knowledge of teaching in a single classroom, at times in overcrowded classrooms. In the contrary, the inclusive system adds the challenge of accommodating learners with variable strengths. Teachers need upskilling and a tremendous shift in pedagogical views to be able to use technology as part of their new skill set. In Tubin and Chen (2002), after supply of computers and laptops to teachers, students delayed having access to computers because teachers had not had the mastery of the computers (Hove & Grobbelaar, 2020). Ndibalema (2014) found that teachers did not integrate ICT in teaching even though they had positive attitudes towards ICT (Mirzajani et al., 2016).
- **System-level barriers:** ICT implementation as part of national education policy is well and good but the day-to-day implementation and utilisation of these ICTs in a dynamic

curriculum and educational environment and budget-constrained system may pose a very serious dilemma.

In South Africa, funding for the Inclusive Education has been increasing steadily from R1.8 billion in 2004/2005 to R2.2 billion in 2007/2008 (Components of the Education System, 2008). These figures give a picture of the state of Inclusive Education six years immediately before and after the White Paper was gazetted and the department geared itself to push the inclusive agenda. Ten years later, this may not necessarily be the case as funding could have decreased as observed by (Hove & Grobbelaar, 2020). As pointed out earlier, the private sector has played a very crucial supporting role in terms of infrastructure, hardware and software support. The educational system needs sustainable interventions and not just perhaps zealous temporary measures. Pedagogy transformation is necessary for embracing technology in education, especially for special needs learning that has previously been marginalised. Inflexible pedagogies from standard teaching and learning practice pose setbacks to transformation. Lack of curriculum transformation to suit the unique and variable needs of learners becomes a drawback to student attainment. There needs to be long-term support for curriculum changes and problem-solving strategies and techniques to discourage regression to old and familiar ways of doing things. Becker (1991) in Wetzel (2001: p1) reports that only 5% of technology implementation programmes in schools thrive past a three-to-five-year period. No two environments can be the same but a very flexible and open-minded approach is necessary to deal with stumbling blocks that may arise.

For Inclusive Schools to be able to harness and leverage ICT for ICT-enhanced teaching and learning, the following factors must be considered: a willing and ICT-skilled educator force (Hove & Grobbelaar, 2020); available and accessible ICT infrastructure (Dlamini & Mbatha, 2018; Ratheeswari, 2018); robust school ICT policy that drives and secure school ICT ideals (Lindle, 2019); and identification and removal of perceived barriers. Section 2.5 delves into these factors in more detail.

2.5 ICT related factors under the scrutiny of this study

In this section, and subjections, the research puts the lens on the ICT-related factors that contribute to e-Education by delving through relevant literature.

2.5.1 ICT Infrastructure

Thinking and technically considering assistive learning technologies, it seems there are innovative technologies that could be of benefit and offer support to learners with Special Needs. Though, in reality, these learning technologies such as tablets and any tangible technologies; are not likely to be effectively used presently in schools. Innovative research will guide how these technologies may be used; but the implementation of research findings may take time and therefore there needs to be a promotion of affordable solutions that leverage what is already used in schools or homes. To reduce technology abandonment, there needs to be a leverage of what is already available which may be more effective than trying new technologies chaotically (McKnight & Davies, 2012; Sumak et al., 2017).

Well-maintained and available ICT infrastructure is key as a conduit to promote e-Education. Therefore, ICT-enhanced teaching and learning is the goal to enable teaching and learning of learners with barriers like autistic learners, who may benefit from advanced ICT programmes that would encourage their retention in these Inclusive Schools and encourage social behaviour change. The availability of computer integrated teaching should be determined (Moll and Kruger, 2012) in Inclusive Schools because Inclusive Schools offer another platform to accessible education for learners with barriers.

As with any ICT infrastructure, the schools' ICT environment cannot be in isolation. It would be implemented based on the country's national information and telecommunications infrastructure. There are considerations, though, that must be taken seriously when looking at implementing ICT infrastructures, some of which include buildings that house the ICTs and their security; telephony and electricity to be made available (Lindle, 2019). ICTs, like computers that are used by the learners, are usually housed in computer labs where most of the learners can access them (Ford and Botha, 2010; Chigona, Chigona & Davids 2014; Ghavifekr, 2016). These computer labs may be at the school library or a specific classroom designated for such use. Classrooms can be characterised as dispersed-technology or limited-technology classrooms. In the former, learners engage with a technology more frequently than the teacher; for example, each learner having access to their own desktop, as is the setup in the computer lab. In the latter, the teacher would engage more with the technology than the learners; for example, when using a whiteboard or smartboard for teaching. In a study to observe technology usage in classroom situations, Bielefeldt (2012) found that learners engaged more with the

technology when it was placed in a “dispersed-technology classroom” as compared to when it was placed in a “limited-technology" classroom.

ICT deployment in Inclusive Schools plays a significant role in the provision of teaching and learning. Developed schools’ systems may advocate for varied deployment of teaching and learning ICT tools like computers, interactive whiteboards in classrooms and school libraries and isolated computers around the school (UNESCO, 2015). On the other hand, traditional schools may still opt for the school laboratory set-up owing to budget constraints (Hove & Grobbelaar, 2020) and as such, their school ICT policies would speak to such constrained provision of ICT-enhanced teaching and learning in school computer laboratories.

Trucano (2011) mentions other reasons in the context of developing countries, which have influenced decisions on the ‘computer-lab model’ (amongst others as:

- a safety and security measure creating a locked room with bars on windows
- the fact that computers are often introduced in tandem with a new curriculum promoting the development of 'ICT literacy' skills, for which a dedicated room, and dedicated teacher, is required;
- the opportunity for schools to upgrade physical infrastructure with some of the funds allocated for school computerisation; and
- potential to use the facilities in two ways, for example where a computer lab is utilised for pedagogy during contact time and utilised by the community outside of school contact time)

Constrained school ICT deployment could be a barrier in Inclusive Schools where ICT-enhanced teaching and learning for all types of learners is desired, as it could dictate that such learners be separated from the normal classroom setup. The other side of the spectrum is the reality of the common school-level barriers among others of security threats and theft to expensive ICT (UNESCO, 2015; Lindle, 2019).

Administrative ICTs would normally be available in the administration block or school office environment. This suggests that these ICTs are commonly stationary and not mobile except for educator laptops and mobile devices (Ford & Botha, 2010). At some advanced schools, each classroom can be equipped with a desktop computer for the teacher (Hove & Grobbelaar,

2020). While teachers can be provided with necessary ICT for teaching, their perceptions and attitudes contribute a great deal to successful implementation of ICT-enhanced teaching and learning (Motsi & Chimbo (2017).

2.5.2 Teacher ICT perceptions

An Inclusive Education system places a great demand on teachers; therefore, realisation of the school's projected educational goals rests on the teachers being empowered and competent. Teachers must be empowered and competent to plan and accommodate a diverse range of learning needs. They may also be able to monitor students' progress and have effective interventions through the affordances provided by ICT-rich learning environments. Whilst the key pillars of achieving an Inclusive Education model in a school environment include creating these ICT-rich learning environments and equipping teachers oh how to personalise student's learning; (Motsi & Chimbo, 2017; Hlengwa, Chimbo & Buckley, 2018) are of the view that the attitudes and perceptions of teachers in relation to ICT is crucial. The past achievements of the traditional system and its comforts may hinder some teachers from being receptive of new opportunities (Jenkins, 2009; Sumak et al., 2017). ICT-enhanced teaching and learning in Inclusive Schools could benefit from an understanding of teachers' perceptions and views, particularly when there is a hindrance to or lack of embracing of the new way of teaching and learning.

Overcoming contextual barriers is possible. Teachers need to be equipped with information and knowledge on how to integrate technological tools in the curriculum (Sumak et al., 2017). How the curriculum is changed, by infusing ICTs, is a very perplexed process that demands commitment from all concerned- from the teachers, school management, and district support team; although the teacher is the key catalyst. Much research has been conducted to probe the role of teachers as leaders in special education (Angelides, Savva & Hajisoteriou, 2012). Teacher training is critical for them to provide and meet the demands of diverse learning needs of the learners in inclusive environments (Walton & Lloyd, 2012; Dlamini & Mbatha, 2018). McKenzie (2004) cited by McGrail (2007) emphasises that technology should be introduced to teachers, with effective orientation; as imposing technology on teachers may negate any Inclusive Education technology implementation efforts. Laptops, smartboards, mobile phones and other technologies have been (McGrail 2007; Ford & Botha, 2010; Sumak et al., 2017), have been provided to teachers and these have brought both negative and positive experiences for them. These technologies could at times become white elephants, according to Cuban

(2002) cited by Lomicka (2003) and Molepo, Khumalo & Mji, 2015). Dron (2012) observes that good teachers would at most times be good technologists; therefore, an increase in teaching capacity could be expected. The teachers would need to be confident about the knowledge of ICTs. Barriers could arise, including the technology itself as a barrier, when there has not been proper training for the teachers on how to use the technology (Hove & Grobbelaar, 2020). Mohanty (2011) apprises that positive attitudes towards technology is directly linked to teachers having had experienced ICT in their own learning; whilst on the other side of the spectrum, an absent ICT experience in the teachers' learning contributes to a negative attitude. (Motsi & Chimbo, 2017). A negative attitude may be owing to the lack of training on how to apply the ICTs in that aspect of the curriculum. Teacher experience with the technology, for example about one year, does increase flexibility in teaching with technology (Bielefeldt, 2012).

Teachers' experience, attitude, and perception of ICT usage in classrooms has been studied from different angles over the years (Prasojo et al., 2019). Teachers use technology for various reasons. A varied mix of the technologies may also be utilised owing to preference or availability of those specific resources as to realise the teaching and learning goals. Teachers have different views on the use of ICTs in early learning environments; as some see technology as an aid whilst others do not (Mohanty, 2011). Albirini (2006) cited by Al-Zaidiyeen et al. (2010) endorses the fact that use of new ICT technologies in the classroom is majorly predicated by teachers' attitude.

Basic computer literacy skills are usually acquired at Senior Phase whilst at Foundation phase learners may not yet be exposed to ICT; this is due to since senior learners having more independence and reason as compared to junior learners. Young minds need to be captivated whilst learning core literacy and numeracy skills; and introducing ICT at this level, teachers would need to be open-minded on how to train these young diverse learners who may present various learning needs. There are divergent views on the introduction of ICT to young learners, particularly at Foundation Phase. There are early learning teachers who propose that ICTs provide stimulating experiences for learners with Special Needs (Filipe et al., 2019; Yaakub et al., 2019) and are therefore a welcomed; whilst others like (Blatchford & Whitebread, 2003, p.16) cited by Mohanty (2011) argue that ICT use in the Foundation Phase hampers learning and is unhealthy.

Another aspect that may influence teacher perception could be the educator's access to ICT in everyday living, personal characteristics of age, and gender (Buabeng-Andoh, 2012; Motsi & Chimbo, 2017); educational and teaching experience perhaps with teaching practice that is seen to be tried and tested; social environment and culturisation. For teachers to take up the use of technology within their curriculum, there needs to be a sense that their current pedagogy is not satisfying, the change is comprehensible, plausible and useful in new situations (Rogers, 1995; Wetzel, 2001; Dele-Ajayi et al., 2019). In public schools, the teacher's view is usually on large groups of learners in small spaces. Therefore, technology use must be viewed as providing ease to that potentially stressful environment.

There are organisations that assist teachers or educators to be able to flexibly prepare for lessons by providing pre-designed education tools for literacy, numeracy and life skills. Some of these materials are available as downloadable resources or tools such as teacher training videos and free DVDs that can be viewed on a computer or TV (Classroom Solutions, 2018). The role of ICTs seems to be for lesson preparation and teacher training more than for classroom lesson integration. ICTs may not necessarily be utilised for curricula adaptations but more for lesson or classroom contact. Technology integration in pedagogy is not a cut-and-dry process as there are contextual barriers that influence its success or failure (Chisango et al., 2020). Processes like the ST3AIRS Model consists of eight steps developed to overcome contextual barriers to schoolteachers as they integrate technology. The model focuses on strategies to integrate the technology, the teacher, pedagogy and curriculum. The components have been discussed in various information technology literature using different terminology from one study to another (Shattuck, 2009). These eight steps are:

- staff development initiatives in the school;
- time to learn;
- a trainer that was qualified;
- transition time to implement the technology;
- access to hardware and software;
- involvement by teachers in the process; and
- recognition of teachers and teacher support.

Teacher perception may have a significant contribution to Individual Readiness (Setati, 2012). Individual Readiness encompasses characteristics, which include an individual's beliefs,

attitudes, level of development, motivation, attitude towards learning, and resistance (Chapnick 2000 cited by Setati 2012) to change. This assumes that perception can be swung positively or negatively owing to other influences within or without the individual. Awareness of teacher perceptions is the first step towards forming holistic views of teacher's state of mind. Teachers play a vital role in the provision of ICT-enhanced teaching and learning.

2.5.3 Continued Teacher ICT Professional Development

Recognising that all teachers require knowledge, skills, values, and attitudes, as well as the necessary support, to integrate ICT into teaching and learning, and to support them in their various roles as mediators of learning, interpreters and designers of learning programmes, leaders, administrators, scholars, assessors and subject specialists, the DBE developed the guideline that sets out the ICT knowledge, skills, values, attitudes neds by teachers to implement the National Curriculum Statement effectively (Guideline: Teacher Training and Professional Development in ICT, 2007)

Continued Teacher ICT Professional Development must be job embedded. Caena (2011) cited by Watkins, De Vroey & Symeonidou (2016) posits that teachers can learn in 'dynamic, ongoing, continuous, and set in daily lives-embedded in the classroom context and constructed through experience and practice, in sustained iterative cycles of goals setting, planning, practicing, and reflecting'. Staff development is very critical in any organisation for improvement of performance, job-satisfaction and meeting company goals. Teachers play an important role in the education system and their development is vital for improvement of their performance, meeting learning outcomes, providing a flexible teaching service, enjoyment of the profession and meeting education goals. This has been a challenge, especially in enforcing the development of new skills by using alternate teaching tools (Inclusive Education in Action, 2015). Professional development improves staff skills and competencies needed to produce excellent learners as teachers are central to educational change (Shohel & Banks, 2012). In addition, e-Education in Inclusive Schools demands professional, dynamic, flexible, and innovative teachers to provide individualised learning using alternate tools. There is considerable growth in pressurising teachers to work together (Ferguson, 2008). Alternate tools that support Inclusive Schools are very technical, technology based and very current, for example, assistive technology. Continued Professional ICT Development is imperative for Inclusive Schools to thrive.

According to the response by the Minister of Basic Education to WC Q91 NCOP, "All future training of teachers will emphasise the capacity of teachers to support learners who experience barriers to learning in ordinary classes". Therefore, equipping educators for dynamic teaching should be investigated in these schools. Inadequate teacher preparation may result in fatigue or exhaustion as the teacher tries to accommodate learners with different learning needs; feeling unprepared for the challenges at hand; create a lack of confidence in the teacher; frustration and unproductivity.

It is crucial, in this time-driven and time-constraint environment, to maximise resources. In some instances, schools may make time available for reserve time for school-based professional development during regular school hours (Ono & Ferreira, 2010). School-based teacher's professional development through technology-enhanced learning contributes significantly to in-service training in resource-constrained context (Shohel & Banks, 2012). Training location must shift from being primarily outside the school to being in schools where learning is embedded in the classroom (Cha, Park & Seo, 2020). Shifting from traditional learning to ICT-based learning is gravely needed (Aktaruzzaman & Che, 2016) to be able to realise e-Education goals. The element of time in training teachers to use technology is key if the education department is to realise its e-Education goals and assist teachers to be confident enough for real curricular integration.

Ono and Ferreira (2010) informed that thousands of rands have been wasted on workshops and conferences that did not yield any change to pedagogy when teachers returned to their classrooms. According to Ono and Ferreira (2010: p.1), the Department of Education introduced a cascading model of teacher ICT professional development where teachers that have been trained would themselves pass on the knowledge to fellow colleagues - this included train-the-trainer concepts. Owing to the concern that at times the district trainers did not understand the curriculum themselves, the "watering down and/or misinterpretation of crucial information" (Fiske & Ladd, 2004: p.162) cited by Ono and Ferreira (2010) resulted. Teacher ICT professional development is viewed as one of the key educational reforms of our times; and that without it there would be no success (Villegas-Reimers, 2003 cited by Ono & Ferreira 2010). School leadership should seek to facilitate communities of practice or professional learning communities as "wells of practice" where teachers can draw out ways to improve their teaching and practice (Ferguson, 2008). In a research by Tubin and Chen (2002) on school-based staff development for teaching in computerized learning environments, the results found

that there are three components that contribute to successful teacher training being ICT infrastructure, clear school ICT policy that displays the rationale and objectives, and professional IT people within the school.

2.5.3.1 Teacher ICT Professional Development examples

ICTs can be used to expand access to and the quality of teacher training. Mohanty (2011) illustrated two examples of professional development initiatives:

- Cyber Teacher Training Centre (CTTC) in South Korea taking advantage of the Internet to deliver better teacher ICT professional development opportunities to in-service teachers. As the CTTC is government funded, it offers "self-directed, self-paced web-based" courses for primary and secondary school teachers. Online tutorials, with some courses, requiring occasional face-to-face meetings are also offered.
- Indira Gandhi National Open University: satellite-based one-way video- and two-way audio-conferencing was held in 1996, supplemented by print-materials and recorded video, to train 910 primary school teachers and facilitators from 20 district training institutes in Karnataka State. The teachers interacted with remote lecturers by telephone and fax (Mohanty, 2011). Current Internet technology should be utilised so as to provide teacher training. This could be done within the school premises utilising the same available ICTs.

Shohel and Banks (2012) researched on how to use hand-held mobile devices with audio-visual material. The teachers were of the view that the mobile device, iPod, creates interest and makes learning easier than reading a book and that watching video clips is more effective that listening to audio files. An investigation in using lesson video clips via multipoint desktop conferencing (MDVC) to facilitate reflective thinking was investigated by (Hu et al., 2002). Watching oneself and others teach with the ability to engage in discussing real-life examples of teaching with peers and mentors has been recognised as an ideal for reflective teaching. Student teachers can also benefit the most during school-based teaching practice (Hu et al., 2002). Prime Online, was explored by (Griffin et al., 2017) as a professional development tool where learn how to create inclusive elementary classrooms. Prime Online has 35 modules delivered during school open season. Each module has four components of introduction, anticipatory activity, content and discussion and classroom connections. After a year of this professional development intervention, even the teacher's perceptions were influenced positively, and high teacher

satisfaction was generated. Content Acquisition Podcast-Professional Development CAP-PD as a training tool to improve vocabulary for teachers was investigated by Kennedy et al. (2017). This tool had three components: an instructional video, pre-produced instructional materials and feedback for teachers using data output from a classroom observation tool. This tool assisted teachers to improve their vocabulary skills, which assisted to better teacher science in a more confident manner. These examples bring about the element of receiving direct feedback and ongoing coaching and supervision immediately after teachers learn something new, which is more effective that attending workshops. Video-based coaching also enhances training outcomes and needs to be investigated further within school-based training. Performance feedback is provided through the iPad or any tablet technology (Suhrheinrich & Chan, 2017). Online professional networks (PLNs) also provide a viable solution to the professional development dilemma (Cook et al., 2017). PLNs are synchronous or asynchronous online platform for individuals to engage collaboratively in critical thinking and discussions; it is for communication and information retrieval (Falk & Dayton, 2009). PLNs also allow for after-school hours engagement; for example, accessing the technology at home. The only drawback with PLNs could be the fear of the technology itself caused by inadequate experience or lack of access to technology in the educational environment (Cook et al., 2017). Therefore, school technology resources are used for teaching and learning of both student and teacher.

Villegas-Reimers (2003) cited by Ono and Ferreira (2010) suggests the following new view on professional development, it should be:

- based on constructivism;
- perceived as a long-term and contextual process that is linked to school reform; and
- established as a collaborative process and very different in diverse settings.

The challenge will always remain as to how to bridge the gap between intensions of the curriculum and the actual lessons as interpreted and implemented by the school or teacher. Equipping the teachers to be confident in moving their concern from just meeting curricula timeframes to creating conducive environments where the learners can understand concepts has never been so crucial (Ono & Ferreira, 2010). When teachers are well-equipped, autistic learners will benefit. Teacher education is also a key subject in the school environment and must be a school policy issue that influences school curriculum and other key competences (Watkins, De Vroey & Symeonidou, 2016). There is a greater need for closer collaboration between teacher education institutions and schools (Watkins, De Vroey & Symeonidou, 2016).

According to UNESCO (2005a: p.3), teacher ICT professional development training should be reconsidered in many countries to strengthen the school-based pre- and in-service training rather than rely on lengthy traditional institutional pre-service training.'

2.5.4 ICT Community support

Parents of children with learning disabilities should be enabled to make choices regarding where to school their children. The basic premise of inclusive schooling is that all learners receive educational instruction at their local schools (Harriot, 2015). Can school ICT play a role in connecting parents, community and school for access to information? Yes. ICT as a source of information for better parental choices should be investigated. For example, according to Autism Europe, in UN Convention for Persons with Disabilities (2012, p25), some of the key pillars in the provision of inclusive practice include individualised programs, services in a more protected environment, skilled professionals and parents be included in assessments of their children. Including parents (community) promotes a conducive environment where focus shifts from deficits to strengths of individuals with intellectual and or developmental disabilities. It is not the parents alone who need to be involved with schools; it is the school's prerogative also to desire to be involved with families (Ferguson 2008; White Paper 6: Special Needs Education 2010; White Paper: on e-Education 2004). Bransford, Brown & Cocking (1999) contend that technology also broadens connections among the school, community and homes. Connecting for knowledge-exchange and peer-to-peer learning (GIZ Science to Policy Brief 2016) amongst teachers, parents and students is essential. Internet-based applications like Google Docs can be used to increase collaboration among stakeholders (Riggleman & Buchter, 2017). However, it is assumed that the community is technically skilled. School Community ICT support is possible but only when strengthened through effective school policy.

2.5.5 School ICT Policy

A policy can be described as an approach taken by an organisation that concretises its attitude and approach to certain issues (Ball, 1993; GDE, Guidelines on the Management and Usage of ICTs in Public Schools Education in Gauteng 2011). Policies encapsulate a set of procedures that fragmented into rules, methods, responsibilities, timeframes, and jurisdiction (Ball, 1993). Inclusive Schools should have implementable policies that govern and regulate the schoolworking environment for an optimal education service. Among the various school

policies, ICT policy drives the school's e-Education plan. The presence of an ICT policy or plan in a school reflects the school's fundamental strategy for ICT use in education. This ICT policy needs to be comprehensive with clear goals, objectives and controls to pursue the goals of the school. (Vanderlinde et al., 2012) identified types of ICT policy plans: an ICT policy plan as a vision blueprint, a technical inventory and a comprehensive ICT policy plan.

Implementation and evaluation of the ICT policy are equally vital facets that cement its fundamental role of guidance and governance. Nevertheless, some principals have argued that policy implementation often lags even for well-articulated policies (Tondeur et al., 2008). Inclusive school's ICT policy must communicate among other things the school's stance on ICT teacher development, ICT use on teaching and learning, ICT access for diverse learners and ICT maintenance.

School management needs to move away from focusing on just sourcing technological hardware but more on establishing and implementing processes (Wetzel, 2001). The latter should create environments for future growth and expansion, enhancement, proper planning, needs analysis, curbing wasteful expenditure and enabling the schools to plan for future needs in time. This should be well documented into the school policy. Policy plays a role for assisting all within the school environment to have common understanding and create order. Gauging whether the school environment is meeting its administrative and desired goals, the policy plays a very crucial role. The school needs to specify means for financial resources in order to maintain their ICT infrastructure. There needs to be coherence in the utilisation of different types of ICTs at all levels in the educational system. Cohesion is very important to curb wasteful expenditure and for attaining an equitable ICT strategy.

The Gauteng Department of Education (GDE 2011), suggested the following elementary policy criteria for schools that are just starting to use ICT:

- explain overall approach to ICT in the school;
- goals of ICT usage, priorities and timetabling of ICT;
- roles and responsibilities of an ICT co-ordinator; and
- identification of key training needs for teachers, rules or procedures for security and care of equipment (GDE, Guidelines on the Management and Usage of ICTs in Public Schools Education in Gauteng 2011).

According to the United Nations General Assembly (2013), there are three challenges that face primary education in view of persons with disabilities as prioritised in Table 2.2 below. Successful policy implementation should be accompanied by sufficient professional development to transform teaching practice, adequate teacher training and a strong design implementation strategy (Disebo & Pule, 2013). The existence of Inclusive School ICT policy may not equate to successful ICT-enhanced teaching and learning but rather serves to concretise the will and desire of the school to provide individualised, progressive and learner-centred teaching and learning that addresses diverse learner needs. School ICT policy must implicitly communicate its unwavering commitment to address learner disparities so to provide effective teaching and learning that benefits learners with different needs. School ICT policy is obligated to bind itself to provide accessible teaching and learning ICT for Learners with Special Needs.

Table 2.2 Main challenges for ICT in primary schools for persons with disabilities

Challenges	Priority
Lack of policy implementation and/or lack of effective implementation mechanisms	1
Limited access to technology	2
Lack of policies which foster widespread availability of accessible ICTs	3

School ICT policy issues that need attention are:

- flexible copyright for sourcing and procurement of educational content;
- hardware and software maintenance;
- piloting in ICT implementation projects to gauge; and –
- measure potential for adaptation, acceptance and usage, equity, cost, sustainability, responsibility and maintenance and sound procurement frameworks.

According to Rice (2011), in support of evidence-based policy, research studies should be undertaken to examine the efficacy of any policy interventions. He goes on to list some of the essential areas that research would shed light on:

- national demographics on persons with disabilities and number of students likely to benefit from provision of accessible ICTs;
- current ICT infrastructure within the school including number of computers and school connectivity to the Internet;
- types and numbers of accessible ICTs required;

- efficacy and sustainability of current funding strategies for provision and support of ICTs;
- attitudes, knowledge of students, parents and teachers towards accessible ICTs;
- preparedness of teachers to incorporate accessible ICTs into their pedagogical practices;
- availability of support dedicated networks for teachers and students; and
- availability of services such as community-based rehabilitation services that could potentially support students and teachers in the use of high- and low-tech Assistive Technologies (ATs) for use in learning environments.)

The listed items above focus on a national scope but when broken into small research studies they can contribute to school-level ICT policy issues while contributing to the national policy. Some of the items above influence the necessity for this study to assist in establishing and contribute towards a strong evidence-based policy.

According to White Paper on e-Education 2004 ICTs must be made available for information impartation to parents and communities. This information impartation contributes to the realisation of e-Education goals. Another bold vision of e-Education is to create e-schools that will have "access to qualified and competent teachers who use ICT to enhance teaching and learning… and allow community access to its computer facilities after hours" (White Paper on e-Education 2004).

When schools give access to the community with Special Needs children and parents of learners with Special Needs, these ICT facilities can be utilised for further training and practice of these learners while involving the family. The family would be able to gain further knowledge and information on how to support their children's learning. According to (AutismSpeaks, 2015) parent training can empower families to understand their children's conditions and participate in their teaching and learning. It is critical that all stakeholders participate in the learners' instruction, as Inclusive Education needs a holistic approach for its success.

2.6 Summary

ICTs play a very crucial role in education. They may foster creative learning and create learner independence and exploration in learning. Although there are still concerns with their use in education, their potential is great. ICT support tools in learning can be assistive, augmentative,

diagnostic, and remedial. Some Special Needs learners generally are inclined to ICTs, such as computers and mobile devices; and owing to minimal social reciprocal interaction needed when utilising ICTs, it is therefore argued that engaging in ICT-enhanced learning may increase their ability to access education. It has been established that there are barriers that need to be overcome to realise an effective ICT-enhanced teaching and learning environment such as negative teacher perceptions of ICT use in teaching and lack of teacher support and training (Continued Professional ICT Development) in using ICT for curriculum transformation. Teacher training and learning within the school environment might be of benefit to the teachers as it increases the opportunity of getting information as and when needed. ICT in schools should not only be to the benefit of the school but also to the benefit of the community. This view may expose the community to school resources for knowledge and information with reference to supporting learners with barriers.

There are educational factors that related to ICT which impact on the effectiveness of any ICT-enhanced education. These factors will be investigated, and they are: ICT infrastructure, Teacher Perceptions and Attitudes towards ICT use, ICT Policy in the school, Community Support through accessible school ICT and Continued ICT Professional Development. Chapter 3 lays out the research design for this study, which includes the research methodology, data collections methods, data analysis methods, and interpretation.

CHAPTER 3:

RESEARCH DESIGN AND METHODOLOGY

3.0 Introduction

The research process is a sequence of clearly defined steps within a research study (Cooper & Schindler 2014). This chapter deals with the methodology used by the researcher in carrying out the study. Furthermore, this chapter deals with the research design, target population, sampling procedures, research instruments used, instruments validity and reliability, data collection and data analysis techniques.

Research activities are guided by a research design. In the following section, the research design components in this study will be laid out. These include the purpose of the research, the research paradigm, the context, and the research techniques/methods employed.

3.1 The Research Approach

This study adopted a quantitative approach. A quantitative approach with triangulation was relatively utilised explicitly and implicitly in data collection and analysis, survey and interviews used respectively. Informal interviews were conducted to gain background information. The study used quantitative data to answer the research questions with triangulation being used to confirm the findings. According to Creswell (2014), a quantitative research is a means of testing objective theories by examining the relationship among variables. The quantitative aspect enabled the researcher to obtain quantifiable responses to enable inferred conclusions and the numerical data were analysed using statistical procedures. In this case, the quantitative research enabled the researcher to determine the teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement and to determine the impact of educator demographic characteristics on their ICT perceptions. Conversely, triangulation was used to enable the formation of richer findings and conclusions.

Using multiple methods of data collection and data sources contributed to deliver some triangulation. Triangulation is understood and applied differently by researchers, but the gist of its usage is where 'having a cumulative view of data drawn from different contexts, may, as in trigonometry, be able to triangulate the ''true'' state of affairs by examining where the data intersects' (Silverman 2000, p. 98). Thus, triangulation refers to the practice of using multiple sources of data or data collection methods within one study in order to help ensure that the data

are telling you what you think they are telling you (Saunders, Lewis & Thornhill, 2016). This study used some form of triangulation in the interpretation of the findings by combining principals' responses with policy document analysis. The study took in a triangulation method where the semi-structured interviews enabled the researcher to explore e-factors that contribute to the provision of ICT-enhanced teaching and learning (e-Education) in schools, which will in turn move these inclusive schools towards ICT-enhanced teaching and learning for all types of learners in an endeavour to understand and attest to the findings from the document analysis. Resources, time and budget restricted the degree of triangulation in this study.

In this study, the survey method was employed to provide a quantitative or numeric description of trends, attitudes, typical behaviour, beliefs, convictions or opinions of a population by studying a sample of that population. From those results, the researcher generalised or drew inferences to the population (Creswell, 2014). Document collection and content analysis were employed by the researcher to provide a triangulated data analysis.

This study took on the form of a case study to enable a broader understanding of relevant issues while creating room for any form of exploration. In a case study, the researcher notes the dynamics and various aspects of the case. Therefore, it was befitting that various methods be employed so as to best capture the "status" of the case. Embedded in the case study was a survey to answer some of the research questions. Content analysis, semi-structured interviews and structured interviews were also utilised to capture other aspects of the phenomenon being studied.

3.2 Theoretical paradigms and conceptual framework

3.2.1 Research paradigm

A paradigm is synonymous with the term worldview – which is composed of beliefs and assumptions about the knowledge that informs their particular study (Creswell & Clark, 2011:39). Worldviews are philosophical assumptions, which operate at an abstract level and become the lens through which the researcher approaches their study. These are some of the main worldviews that are used in research: post-positivism, constructivism, interpretivism, and pragmatism. This study was driven by the positivism philosophical stance. Positivism was key in the study because it allowed the researcher to apply methods from the natural science to study social reality (Bryman & Bell, 2015). As proposed by Bryman and Bell (2015, p10) the following principles were used in underpinning the research.

- Only phenomena and hence knowledge confirmed by the senses can genuinely be warranted as knowledge.
- The aim of theory is for generation of hypothesis that can be tested and that will allow explanations of laws to be assessed.
- Knowledge is acquired by gathering of facts which provide the basis for laws.
- Science must be conducted objectively.
- There is a clear distinction between scientific statements and normative statements and scientific statements are the true domain of the scientist.

Positivism allowed the researcher to come up with a structured methodology that can be replicated (Saunders, Lewis & Thornhill, 2016). The researcher aimed at pursuing objectivity in order to observe and understand reality. This research enquired on various ICT-related aspects in the school being teacher perceptions and demographics; infrastructure matters and policy documents which mandated a positivist approach so as to be able to test hypothesis.

3.2.2 Frameworks that underpin this study

Frameworks give a study shape, scope and base. This study employed ideas, statements, elements, and perspectives prescribed by various technology systems assessment frameworks. These structures assisted to guide, develop research questions and also evaluate findings. Two frameworks were used to steer and organise this research, namely, Self-Review Framework and the E-Readiness Index.

3.2.2.1 Self-review framework

The Becta's Self-review Framework consists of six elements (previously eight elements) that assist schools to examine their level of ICT use (Naace n.d.) and together provide a comprehensive picture of a school's ICT developments. According to Naace (n.d.), the framework is designed to support all types of schools - infant schools and special schools therefore by using of the framework inclusive schools can know the state of their ICT development so as to enable strategic planning for e-Education for all types of learners and learning needs. The full Self-Review Framework elements are 1. Leadership and management 2. Curriculum 3. Learning and teaching 4. Assessment 5. Professional development 6. Extending opportunities for learning 7. Resources and 8. Impact on pupil outcomes. Each element is divided into strands, which break down further into different aspects.

For this rudimentary exploratory study, four Self-Review framework elements were selected to guide the research questions:

- Learning and teaching;
- Professional Development;
- Extending opportunities for learning; and
- Resources.

This selection was not based on any theoretical influence but rather an idea to pick what can be used rudimentarily. Further studies can select other elements for further exploration of the Johannesburg District case.

3.2.2.2 E-Readiness Index

The South African Institute of Distance Education (SAIDE), which was commissioned in 2010, to investigate the readiness of Gauteng schools to use ICT in teaching learning, developed the E-Readiness Index. This index assists the schools to look at their current status to identify strengths and weaknesses in ICT integration in their schools, the level of achievement or attainment of ICT integration goals and as the basis from which to create their own policies and plan for the future (GDE, 2011: 13).

Here are some of the dimensions relevant to this study that constitute the E-Readiness Index:

- School has an ICT co-ordinator;
- School has an ICT policy / plan;
- Teacher confidence;
- Learner access to computers outside class; and
- School has some form of ICT support.

3.3.2.3 Combined Research Conceptual Framework

This study has been steered from a pragmatic perspective, which means that the researcher has used a combination of various inputs to be able to frame and guide the research enquiry - both in question formation and data analysis and interpretation.

Table 3.1 below depicts the conceptual framework used in this research. The research conceptual framework is a combination of the elements from the two frameworks discussed

above. This is not an integrated framework but rather a combined conceptual framework that guided the framing of the research themes (factors) and questions. The tables below, clarify how the factors and research sub-questions were influenced by the Combined Research Conceptual Framework.

Table 3.1 Combined Research Conceptual Framework

Self-review framework	E-Readiness Index
1. Learning and teaching 2.Professional development 3. Extending opportunities for learning 4. Resources	a) School has an ICT co-ordinator b) School has an ICT policy / plan c) Teacher confidence d) Learner access to computers outside class e) School has some form of ICT support

The factors were (Section 1.5):

- School ICT policy:
- School ICT infrastructure;
- ICT community support according to e-Education goals (White Paper: e-Education 2004);
- Educator ICT perceptions;
- Continued Professional Development in ICT; and
- Identified inadequacies.

The sub-questions were (Section 1.7):

- How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning in Inclusive Schools?
- In Inclusive Schools, how is the current school ICT infrastructure being utilised, after hours, for community support for information access and training of learners with Special Needs?
- What is the status of school ICT policies that support ICT-enhanced teaching and learning?
- What are the perceptions of the teachers using ICT in education, teaching, professional development, and curriculum enhancement?

- Do teachers' demographics influence their ICT perceptions?
- What is the status of the teacher's ICT professional development?
- What are the inadequacies that need to be addressed to assist these Inclusive Schools in moving towards ICT-enhanced teaching and learning?

Self-review Framework		
Self-review Framework item	**Study factor linked to**	**Sub-question(s) linked to**
Learning and teaching	School ICT infrastructure Identified inadequacies Educator ICT perceptions	# How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning in Inclusive Schools? # What are the inadequacies that need to be addressed to assist these Inclusive Schools in moving towards ICT-enhanced teaching and learning? # What are the perceptions of the teachers using ICT in education, education, teaching, professional development, and curriculum enhancement?
Professional development	Continued Professional Development in ICT	# What is the status of the teacher's ICT professional development?
Extending opportunities for learning	ICT Community Support	# In Inclusive Schools, how is the current school ICT infrastructure being utilised, after hours, for community support for information access and training of learners with Special Needs?
Resources	School ICT infrastructure Identified inadequacies	# How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning in Inclusive Schools? # What are the inadequacies that need to be addressed to assist these Inclusive Schools in moving towards ICT-enhanced teaching and learning
E-Readiness Index		
E-Readiness Index item	**Study factor linked to**	**Sub-question(s) linked to**
School has an ICT co-ordinator	School ICT infrastructure	*Addressed in the specific questions asked to the respondents under the sub-question*: # How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning in Inclusive Schools?

School has an ICT policy / plan	School ICT policy	# What is the status of school ICT policies that support ICT-enhanced teaching and learning?
Teacher confidence	Educator ICT perceptions	# What are the perceptions of the teachers using ICT in education, education, teaching, professional development, and curriculum enhancement? # Do teachers' demographics influence their ICT perceptions?
Learner access to computers outside class	ICT Community Support	# In Inclusive Schools, how is the current school ICT infrastructure being utilised, after hours, for community support for information access and training of learners with Special Needs?
School has some form of ICT support	School ICT infrastructure	*Addressed in the specific questions asked to the respondents under the sub-question:* # How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning in Inclusive Schools?

3.2.3 Summary

This study is underpinned by the frameworks mentioned above. The frameworks were used at conceptual levels for the direction of the study, development of concepts and constructs that need to be explored and tested, framing of the analysis and critiquing of the findings. By exercising use of triangulation, these frameworks will assist the schools to identify **where they are currently; where they need to go and how to get there.** Triangulation was appropriate in that that before delving into specific ICT interventions for all type of learners, there needs to be an enquiry into these foundational factors in the education system with reference to ICT. These foundational factors would be critical to these inclusive schools to move towards e-Education for all types of learners.

3.3 Research context

3.3.1 Johannesburg Central District- the case

The GDE consists of provincial, district and sub-district levels of educational management. District-levels manage a sizable portion of schools within geographical areas - Johannesburg Central District is one of them. This district geographically encompasses the Greater Soweto and Lenasia areas. Some of the functions of the District relative to Inclusive Education service are to co-ordinate learner referrals to therapists, administer psychological interventions to

learners identified with learning barriers and assist the schools with educator training support. The District also plays an important role in administering the Gauteng Online Internet solution for schools as implemented by the GDE. This facility is maintained through a contract between the provincial department and a private company.

3.3.2 Inclusive / Full-Service schools background within the District

In alignment with the national Inclusive Education system in 2009, one school, Lakeview Full Service Primary School, was selected as the pilot school for the Inclusive Education initiative. This school caters for all types of learners who are not severely impaired. According to the principal, this school caters for children with mild challenges that can be controlled by remedial methods as well. The school caters for learners in the surrounding impoverished areas, including Nancefield Hostel, Kliptown, Slovo Park and Chris Hani squatter camp (Seabelo in Jabavu Urban News 2013). Social services, counsellors and therapists are based at this school to attend to the needs of the learners and to liaise with the District Office. Later, four more schools were identified and converted to Inclusive Schools within the Johannesburg Central District.

3.4 The research technique / design

Research design is a type of inquiry within qualitative, quantitative and mixed methods approaches that provide specific direction for procedures in a research study (Creswell, 2014). It is the blueprint for fulfilling research objectives and answering questions (Cooper & Schindler, 2014). This study employed an eclectic mix of techniques that suggest that combining both quantitative and qualitative data provides better understanding of the research problem (Creswell, 2012). The study was defined as quantitative using multi-methods to support the background information that will assist in coming up with recommendations. A case study was used in this case the Johannesburg Central District and survey research design was done within the case study.

The research design comprised three elements of sampling, data collection and data analysis. To begin the process, the researcher first conducted informal interviews.

Initially, the researcher conducted informal interviews with the Principal of Lakeview Primary School - where the full-service project was initially piloted by the then national DoE. This pilot project was used to gain understanding of the dynamics involved in providing an Inclusive

Education within primary schooling. Intensive information on inclusion and the progress made so far was provided by the principal. The researcher then requested an opportunity to have informal interviews with the Learner Support Educators (LSE's) at that school. LSE's play a pivotal role in affording learners with barriers an opportunity to receive education in mainstream schools. The researcher requested the names of other schools who have been converted to Full-Service. This information was provided by the principal. The researcher then moved to make contact with these four full-service schools by searching the Internet under government websites and general business directories. Eventually, the principals were contacted, and appointments were scheduled for face-to-face meetings.

Conversations with the principals and certain school governing body members of the schools gave an opportunity for the researcher to explain the reasons for the research. This also enlightened the researcher to a certain aura that prevails- discomfort with research projects conducted in the schools as if the researcher is to open a "can of worms". At one school, the researcher was met with a comment that assured the researcher of the serious need for this study. A school governing body member emphatically pronounced that "we do not need ICT as we have been doing well up to now". Interestingly, this statement was uttered before the researcher could reveal the reason and nature of the research.

These informal conversations allowed the researcher to gain insight into the school environment, background of inclusion in the schools, management structures etc. Information on the types of students that are catered for in the school was also obtained, that is, the inclusive paradigm so far proposes the assistance of learners with physical challenges, for example, paraplegic or blind. As the schools have not been equipped with necessary resources and knowledge on how to provide education for other type of learners needing assistance; for example, when Autistic learners are identified, they are sent to other appropriate LSEN schools.

3.4.1 Sampling

A population is a group or collection that a researcher is interested in generalising about and more formally, it is the theoretically specified aggregation of study elements (Rubin & Babbie, 2016). According to Cooper and Schindler (2014), the target population are those people, events, or records that contain the desired information for the study that determine whether a sample or a census should be selected (Cooper & Schindler, 2014). The population can be

hypothetical or real. It may be, at times, impractical and uneconomical to involve all the members of a population in a study project.

The population in this study were 127 educators, which included four principals of four inclusive primary schools in Johannesburg Central District. Educators included class teachers, LSE's, heads of department (HoDs), deputy principals and all SMT members who also had teaching time in class and computer specialists. The principals were asked to provide the number of educators that they have in the school, excluding the Grade R teachers. It is therefore necessary to take a sample of the population. A sample is therefore a finite part of the population, which has properties of the whole population. A sample is the segment of the population that is selected for research, that is, it is a subset of the population (Bryman & Bell, 2015). According to Bryman and Bell (2015), the method of selection may be based on a probability sampling or non-probability sampling depending on the nature of the study.

For the qualitative study, sampling was non-probabilistic, purposive and self-selective in that the principals were known beforehand, were approached deliberately and were given an opportunity to self-selectively participate in the study. According to Bryman and Bell (2015) purposive sampling is often used where the focus is more on understanding the phenomenon than on generalizability of the findings. This rudimentary study aimed to understand the current state-of-affairs in inclusive schools.

For the quantitative part, a probability sampling technique was used. Probability sample is a sampling technique in which every member of the population has a known, non-zero probability of selection (Quinlan et al. 2019). According to Bryman and Bell (2015), random sampling is a procedure used to select sampling elements in a quantitative study and it is based on probability theory. Each unit of the population has a known and equal probability of inclusion in the sample. The probability sampling techniques used were stratified random sampling and simple random sampling. Stratified random sampling is a probability sampling procedure that uses stratification to ensure that appropriate numbers of elements are drawn from homogeneous subsets of the target population (Rubin & Babbie, 2016).

In this case, the schools were classified into school A, B, C, and D and were the strata. A simple random sample was taken from each stratum. Simple random sampling is a sampling technique that requires that each individual in the population has an equal chance of being selected.

Random samples were taken from each stratum. According to Gay et al. 2009 (cited in Leedy & Ormrod, 2015, p221), if a population is 100 or fewer do not sample but rather take the whole population as your sample. If the population size is around 500 (give or take 100), 50% should be sampled, if the population size is around 1 500, 20% should be sampled and beyond a certain point (about N = 5 000), the population size is almost irrelevant and a sample size of 400 will be adequate. In this case, the population is 127 and therefore 50% of the sample was to be selected, that is 64 participants. According to Leedy and Ormrod (2015), when questionnaires are posted to participants, the response rate is normally below 50%. In this case, to ensure that 64 teachers participated, 100 questionnaires were administered to the schools and 78 were returned. The researcher views this as a successful response rate especially with the fact that the sample was self-selected, that is, educators had a choice to be or not to be in the sample.

3.4.2 Data Collection Method

Three data collection methods were used in this study. They include structured closed-ended informal interview of the principals, an imbedded survey of the teachers and document / content analysis of the policies. The researcher was of the view that certain research questions would need a triangulated approach to capture the essence of the matter and thus answer the questions with more depth.

Informal interviews

Informal interviews were conducted with the four principals for background information. Field notes were taken as and when necessary.

Principals questionnaire

The principal questionnaire (Appendix D) had two sections as well. Section A sought to establish the profile of the respondents including biographical or demographical information.

Section B sought to determine the available ICT infrastructure in the schools and their use therein; the existence of inclusive ICT policy in the schools; and exploring the issue of utilising school ICT infrastructure for community support. Opinions on school ICT policy and community support were obtained using ordinal scale of 1- Yes; 2- No and; 3- Partially. In either response of Yes or No, the principals were asked to explain further and express their personal views.

Bryman and Bell (2015) assert that the use of questionnaires is a popular method of data collection because of the relative cost effectiveness with which they are constructed and administered. Questionnaires were also utilised in this research. The questionnaires were delivered to the schools and then collected at the agreed timeline. The main purpose of the questionnaire was to gather perceptions and opinions of teachers with regards to ICT-related factors and the statistical information provided by the principals on their school's ICT infrastructure and opinions on school ICT assets being used for community support.

The perceptions were rated using Likert scales, which are most beneficial when measuring latent constructs - that is, characteristics of people such as attitudes, feelings, opinions, etc. Latent constructs are generally thought of as unobservable individual characteristics (meaning that there is no concrete, objective measurement) that are believed to exist and cause variations in behaviour (e.g., answer questions on a scale). Categorical, numerical and ordinal scales were employed.

Teacher questionnaire

The educator questionnaires (Appendix C) were delivered to the schools and then collected at the agreed timeline. The main purpose of the questionnaire was to gather perceptions and opinions of teachers with regards to ICT-related factors.

The educator questionnaire had two sections. Section A sought to establish biographical and demographical information that were used for hypothesis testing. Section B sought to determine their perceptions on ICT use in teaching, curriculum transformation and training. Sub-categories used were teacher competence, teaching using ICT, curriculum enhancement and ICT in education where opinions were measured according to 1- Strongly Disagree; 2- Disagree; 3- Agree and; 4- Strongly Agree. Opinions on the benefit of the type of delivery method were obtained using ordinal scale of 1- Most beneficial; 2- Less beneficial and; 3- Least beneficial. ICT devices accessible to the educators were obtained using an ordinal scale of 1- Daily; 2- Weekly; 3- Monthly; 4- Occasionally and 5- Not at all. Also included was an open-ended question, which was meant for teachers to express their personal views on possible delivery methods for ICT training.

Document Collection

The secondary data collection method was document collection. The researcher obtained ICT policy documents of the schools to analyse their content. The request was made to the principals, who made copies of their schools' ICT policies. Only three schools out of the four had available ICT policies. The documents were evaluated to also make comparisons between the schools.

Table 3.2 below summarises the data collection structure of this study reflecting the extent of the use of both quantitative and qualitative methods to answer the research questions.

Table 3.2: Research Study data collection methods

Quantitative	Qualitative
Survey questionnaire with teachers: Research questions: What are the perceptions of the teachers using ICT in education, teaching, professional development, and curriculum enhancement? Do teachers' demographics influence their ICT perceptions?	Semi-structured Interviews with principals Research questions: How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning in Inclusive Schools? In Inclusive Schools, how is the current school ICT infrastructure being utilised, after hours, for community support for information access and training of learners with Special Needs? What is the status of the teacher's ICT professional development? What are the inadequacies that need to be addressed to assist these Inclusive Schools in moving towards ICT-enhanced teaching and learning?
	Document analysis of ICT policy documents Research question: What is the status of school ICT policies that support ICT-enhanced teaching and learning?

3.4.3 Data analysis

According to Bryman and Bell (2015), data analysis involves examining the collected data; look for patterns in that data and then draw conclusions - make inferences and deductions. The questionnaires used in this study contained both qualitative and quantitative data on which statistical techniques were used for analysis.

Statistical techniques

The purpose of data analysis is to change data into information that can be used for decision-making. The qualitative data was analysed, and the results of the interviews were presented using a thematic approach by arranging the data into themes and sub-themes.

For the quantitative part, the data were read into Microsoft Excel and then exported to SPSS version 24 for analysis. The instrument was first tested for internal consistency reliability using Cronbach alpha. A high value of Cronbach signifies that the items are measuring the underlying (or latent) construct. According to Leedy and Ormrod (2015), internal consistency reliability is the extent to which all of the items within a single instrument yield similar results. It examines how unified the items are in a test or measurement (Salkind, 2018). The Cronbach alpha ranges from 0 to 1 and a value of 1 denotes perfect internal reliability and 0 denotes no internal reliability (Bryman & Bell, 2015). Manerikar and Manerikar (2015) provided a rule of thumb where if Cronbach alpha is ≥ .9 – excellent (high-stakes testing), ≥ .7 – good (low-stakes testing), ≥ .6 acceptable, ≥ .5 poor and < .5 unacceptable. The reliability of the instrument is given in Table 3.3 below.

Table 3.3: Reliability results of the constructs

Aspect	No. of items	Cronbach's alpha	Acceptable level
General ICT perceptions	20	.834	Good
Type of delivery method	8	.826	Good
Level of benefit	7	.784	Good
Level of use	7	.815	Good
Total	***42***	***.864***	***Good***

A high value of Cronbach alpha signifies that the items are measuring the underlying (or latent) construct. In this case, according to Manerikar and Manerikar (2015), a Cronbach alpha of .7 or more depicts a reliable scale and all dimensions achieved the minimum threshold as proposed by Manerikar and Manerikar (2015). The overall reliability of the instrument was .864, which is good. Therefore, the instrument was reliable.

Data were presented using descriptive statistics and inferential statistics. According to Jackson (2014), descriptive statistics provide numerical measures that describe a distribution by providing information on the central tendency of the distribution, the width of the distribution, and the shape of the distribution. Conversely, inferential statistics are procedures for drawing conclusion about a population based on data collected from a sample. Descriptive statistics were used to organise and summarise the data using frequencies, proportions and means to determine patterns and trends in the data. In this case, a four- point Likert scale was used, which ranged from 1 strongly disagree to 4 strongly agree. A mean score of less than 2.5 indicated disagreement while a mean score of at least 2.5 indicated agreement. The 3-point Likert scale ranged from 1 most beneficial to 3 least beneficial. Therefore, an average close to 1 meant most beneficial and an average of 3 meant least beneficial. The Likert scale from level of use ranged from 1 daily to 5 not at all. Composite variables were created by averaging the items. The composite variables were:

- Teacher competence;
- Teaching using ICT;
- Curriculum enhancement;
- ICT in education;
- General ICT perceptions;
- Type of delivery method beneficial in receiving ICT training;
- Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students;
- Level of benefit perceived of ICT device in teaching in inclusive environments; and
- Level of use of ICT devices.

Exploratory factor analysis was used to measure the validity of the instrument. Factor analysis is a technique that attempts to identify a small number of underlying variables or factors that cannot be measured directly but that explain the observed correlations among measured variables (Dugard, Todman & Staines, 2014). Variables that are correlated with one another but largely independent of other subsets of variables are combined into factors (Tabachnick & Fidell, 2014). The method used was principal component analysis using a varimax rotation. A varimax rotation is one of the most popular orthogonal factor rotation methods focusing on simplifying the columns in a factor analysis. It is generally considered superior to other orthogonal factor rotations methods in achieving a simplified factor structure (Hair et al., 2019).

There are several methods that can be used to determine the number of factors. However, the latent root criterion is the most commonly used technique. A latent root or eigenvalue is a column sum of squared loadings for a factor and it represents the amount of variance accounted for by a factor (Hair et al., 2019). According to Hair et al. (2019), the rationale for the latent root criterion is that any individual factor should account for the variance of at least a single if it is to be retained for interpretation. The authors further indicated that with component analysis, each variable contributes a value of 1 to the total eigenvalue and only the factors having latent roots or eigenvalues greater than one are considered significant while those with latent roots less than one are considered insignificant and are disregarded.

The appropriateness of the factor analysis depends on the sample size and overall measures of inter-correlation. According to Hair et al. (2019), the sample size should be at least 40 and partial correlations should be small. The appropriateness of factor analysis was measured using a measure of sampling adequacy called the Kaiser-Meyer Olkin (KMO) and Bartlett Test of Sphericity. The Bartlett Test of Sphericity is a statistical test for the presence of correlation among the variables and it provides the statistical significance that there are sufficient correlations to proceed with factor analysis. In contrast, Kaiser-Meyer Olkin (KMO) is a measure of sampling adequacy, which quantifies the degree of inter-correlations among the variables it ranges from 0 to 1 (Hair et al. 2019). Kaiser (1970; 1974) provided a rule of thumb where .8 or above, meritorious; .7 or above, middling; .6 or above, mediocre; .5 or above, miserable; and below .5 is unacceptable. A KMO of .50 and above is considered suitable for factor analysis (Tabachnick & Fidell, 2014; Hair et al. 2019). The Bartlett Test of Sphericity tests the null hypothesis that there is lack of sufficient correlation. If it is significant, that is, it has a p-value less than .05, and then the correlation matrix has significant correlations among at least some of the variables (Hair et al., 2019).

The communality is the proportion of variance accounted for by a factor in a factor analysis (Dugard, Todman & Staines, 2014). According to Tabachnick and Fidell (2014), the communalities should be above .5. However, most of the variables should have communalities above.6 (Hair et al., 2019). In terms of the factor solution, it is considered to be robust if the amount of variance explained is at least 50% (Pallant, 2016).

In terms of inferential statistics, the independent t-test and ANOVA were used to determine the impact of educator demographic characteristics on their ICT perceptions. The independent

t-test was used where the variables had two categories while the ANOVA was used where the variables had more than two categories. Two sampling distributions are said to be independent if there is no relationship between specific values of the two distributions (Brase & Brase, 2015). Therefore, an independent t-test is a parametric inferential test for comparing samples of two independent group of scores (Jackson, 2014). The independent t-test assumes that the observations within each sample must be independent and the two populations from which the sample is selected must be normal (Gravetter & Wallnau, 2017). In this case, the sample was randomly selected, and independence was met. The central limit theorem was used to achieve normality. The central limit theorem postulates that the sampling distribution of the mean of a random sample drawn from any population is approximately normal for a sufficiently large sample size. The larger the sample size, the more closely the sampling distribution of the mean will resemble a normal distribution (Keller, 2018). In this case, the sample size was 78 observations which were large enough. The independent t-tests also depend on homogeneity of variances, that is, equality of variances. Levene's test for homogeneity of variance was used to determine equality of variances. In the case where the test was significant, variances were unequal, the statistics under equal variances not assumed were discussed and, in the case, where the test was insignificant, that is, the variances were equal, statistics under equal variances assumed were discussed.

The hypothesis to be tested was

H_o: The means are equal ($\mu_1 = \mu_2$)

H_1: The means differ ($\mu_1 \neq \mu_2$)

The 5% level of significance was used. An important statistic called the measure of effect size was used to describe significant relationships. According to Gravetter and Wallnau (2017), a measure of effect size is intended to provide measurement of the absolute magnitude of a treatment effect, independent of the size of the sample (s) being used. Effect size is the proportion of variance in the dependent variable that is accounted for by the manipulation of the independent variable (Jackson, 2014). Determining the effect size involves finding an estimate for the difference between the means and a measure of the standard deviation.

*T*he effect size was calculated using the formula:

$$\eta^2 = \frac{t^2}{t^2+(N1+N2-2)}$$

Where t^2= test statistic squared, N_1 is the sample size for first group and N_2 is the sample size for second group

Cohen (1988) proposed the following guidelines where the effect size can be described as small effect with a value of .01, moderate effect with a value of .06 and large effect with a value of .14.

The one-way analysis of variance (ANOVA) was used to determine the difference in means where the variables have three or more categories. ANOVA is really a set of analytic procedures based on a comparison of two estimates of variance and it is an inferential parametric statistics test for comparing the means of three or more groups (Tabachnick & Fidell, 2014; Jackson, 2014). ANOVA is based on the comparison of two estimates of variance where one estimate comes from the variation between groups. This occurs when scores may differ from one another because they belong to different groups with different means whilst the other estimate is the variation within groups, which occurs when inherent differences unique to each subject and difference due to chance may cause a particular score to be different from the mean of its own group (Brase & Brase 2015). If these two estimates of variance do not differ, one can conclude that the entire group means come from the same sampling distribution of means and that the slight differences among them are due to random error (Tabachnick & Fidell, 2014). The ratio of the two estimates is called the F-ratio. The F-ratio is the variation between groups to the variation within groups (Jackson 2014). If the means do not differ then there is homogeneity between groups. The hypothesis to be tested was:

H_o: The means are equal.

H_1: At least one of the pairs of means is different.

The 5% level of significance was used, and the rejection of the null hypothesis resulted in at least one pair of means being different.

ANOVA is an extension of the independent t-test and has the same assumptions as the independent t-tests but in addition, there should be homogeneity of variance, that is, the variances of the groups must be equal. Levene's test of homogeneity of variance was used to test for equal variances across the groups. If the test was significant, post-hoc tests were done to determine where the differences lie. A post hoc test is a means of comparing all possible pairs of groups to determine which ones differ significantly from each other (Jackson, 2014).

The Tukey B post hoc analysis was used to determine which groups differ in means where group variances were equal. If the variances across group were not equal, the Welch robust test of equality of means was used to test mean difference and where the mean differences exists, Games-Howell test was used as a post hoc test.

The measure of effect size for ANOVA is denoted by eta squared (η^2) where eta squared is an inferential statistic for measuring effect size in ANOVA when variances across groups are equal. According to Jackson (2014), η^2 reflects "the proportion of the total differences in the scores that is associated with differences between sample means, or how much of the variability in the dependent variable is attributable to the manipulation of the independent variable" (Jackson 2014, p234) and is calculated as

$$\eta^2 = \frac{SS_{between}}{SS_{Total}}$$

The $SS_{between}$ is the between groups sum of squares, which reflects the differences between the means from the various levels of an independent variable and the SS_{Total} is the total sum of squares, which reflects the total differences between all scores in the experiment (Jackson, 2014).

In the case where the variances were not equal, the effect size was calculated using the adjusted omega squared, that is, omega-squared (ω^2) given by:

$$\omega^2 = \frac{df_{bet}(F-1)}{df_{bet}(F-1)+N_T}$$

where df_{bet} is the degrees of freedom for factor A which is the number of levels of factor A – 1, F is the Welch F test statistic and N_T is the total number of subjects (Keppel & Wickens, 2004).

Both inferential statistics were done using the p-value approach. Assuming the null hypothesis is true, the probability that the test statistic will take on values as extreme or as more extreme than the observed test statistic (computed from the sample) is called the p-value of the test. Moreover, the smaller the p-value computed from the sample data, the stronger the evidence against the null hypothesis (Brase & Brase, 2015). The results of the test are significant if the p-value is less than .05.

Document (content) analysis

According to Oates (2006), the ICT policy documents were analysed as both vessels and objects. The document content was analysed deductively and thematically to determine the relevance, currency, and appropriateness in the current educational setting to achieve the intended goals of inclusivity. An ICT Policy Matrix developed specifically for this study was utilised to examine the policies as shown in Table 3.4 below. The matrix assists in answering questions and providing data that would be merged (during interpretation stage) with the principal interview data- thus provide some form of triangulation.

Table 3.4 ICT Policy Matrix

Name of policy / date of publication	What is the name of the policy?
Purpose	What is the purpose of the policy?
Implications on teaching	Does your ICT policy specify the use of ICT for teaching purposes?
Implications on teaching Special Needs Learners	Does your ICT policy specify the use of ICT for teaching learners with barriers / special needs
Implications on the learning of Special Needs Learners	What does the policy say about using school ICT in the learning of Special Needs Learners?
Implications on provision of Inclusive Education	What does the policy say about provision of all types of learners?
Implications on provision of access to the community	Does your policy specify the use of school ICT infrastructure for community support and access? What are the guidelines for providing the community with access to learning resources
Implications on provision of ICT infrastructure	How is the ICT infrastructure provided and supported by the school?
Implications on ICT infrastructure maintenance	What are the guidelines for ICT infrastructure maintenance?
Implications on teacher professional development	How is the school ICT infrastructure used for professional development?

The three policies analysed were:

- Policy on the Use of Tablet devices and 3G/Wi-Fi connectivity supplied to schools in terms of the Gauteng Province e-Learning solutions programme;
- Guide on GautengOnline (GoL) code of ethics and conduct; and
- Computer Room Policy.

Table 3.5 below summarises the data analysis process followed to answer the research questions.

Table 3.5: Research Study Data analysis matrix

Data	**Teacher Survey Data**	**Principal interview data**	**ICT policy data**
Research method	Quantitative	Qualitative	Qualitative
Research question(s)	What are the perceptions of the teachers using ICT in education, teaching, professional development, and curriculum enhancement? Do teachers' demographics influence their ICT perceptions?	How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning in Inclusive Schools? In Inclusive Schools, how is the current school ICT infrastructure being utilised, after hours, for community support for information access and training of learners with Special Needs? What is the status of the teacher's ICT professional development? What are the inadequacies that need to be addressed to assist these Inclusive Schools in moving towards ICT-enhanced teaching and learning?	What is the status of school ICT policies that support ICT-enhanced teaching and learning?
Tool	SPSS statistical techniques	Descriptive and narrative qualitative techniques ; thematic analysis based on research questions	Content analysis using ICT Policy Matrix developed specifically for this study

Data analysis was undertaken using quantitative techniques whilst qualitative techniques were also applied for triangulation purposes. Statistical techniques through statistical software; descriptive and narrative techniques; and content analysis using a matrix development specifically for this study were used.

3.5 Discussion of the findings and critical review

Subsequent to data analysis, a discussion of the findings took the form of a critical review which would assist in providing a comprehensive and holistic 'answer' to the study's main research question:

Are inclusive schools moving towards ICT-enhanced teaching and learning?

3.6 Validity and Reliability of instruments

Validity and reality of the instruments used in the study was achieved as follows:

3.6.1 Instrument validity

Validity is concerned with whether concept measurement measures really measures the concept it is intended to measure- the meaningfulness of research components (Bryman & Bell, 2011; Babbie, 2017). Validity is the measurement of the extent to which a questionnaire measures what it claims to measure. After analysis of the results obtained, there must be a level of confidence that the data represent the phenomenon being studied. This study used content and face validity. Content validity entails ensuring that the questionnaire addresses the objectives. The researcher arrived at face validity through the comments of the supervisor, co-supervisor and the statistician. After the critique of the questionnaire and the rigorous modification thereof used by the researcher, the instrument became unambiguous and well structured (see Annexure C and D). Validity of the instrument was also tested using exploratory factor analysis (see Section 4.3.2).

Although face validity may be perceived as a weak form to measure validity, it was sufficient to permit the researcher to continue with the study. The GDE granted the researcher permission to conduct the study after perusing through both the teacher and principals' questionnaires to ascertain that the questions put forward were relevant for the intended audience (see Annexure A).

3.6.2 Reliability of Instruments

The reliability of an instrument is tested to find out if it will bring out the required information (Bryman & Bell, 2015) – (see Section 3.6.1 above).

3.7 Ethical considerations

Ethical considerations necessitate that a researcher should be aware that for them to be regarded as responsible researchers in today's society, they need to be cognisant of the different ways their research can impact individuals, groups, communities, organisations, and the society at large (Remenyi, 2012).

3.7.1 Permission to conduct the study

A request to conduct this study was submitted to the GDE. Permission was granted (Appendix A). Subsequently, the researcher informed the Johannesburg Central District, as per GDE guidelines, of the intentions to conduct the study in their four schools. The research was officially recognised by an official letter from the District. The researcher also proceeded to request to conduct the research at the four schools through an official letter, and the request was granted. Furthermore, a request was made to Unisa for Ethical Clearance (Annexure B1 and B2). This was granted by the university confirming that the research has satisfactory ethical considerations.

3.7.2 Confidentiality, anonymity and privacy

The participants were assured anonymity and had to sign a consent form (Appendix C). They were informed that their participation in the survey was voluntary and by no means binding. They could choose to withdraw from the research at any time without any negative or undesirable consequences to them. Anonymity would be ensured where appropriate, responses would be treated in a confidential manner, and there would be no incentives or rewards for participating in this survey.

3.8 Summary

A quantitative descriptive mixed-method research design using a survey questionnaires and document collection research was used. Statistical tools to determine the correlational relationships among the observed variables were used. Furthermore, other statistical tools e.g. factor analysis were recommended for the determination of relationship of unobserved variables. The predominantly questionnaire survey data collected were analysed using SPSS.

Reliability was improved by peer-reviewing of the research questionnaires to help refine and ensure its effectiveness. Ethical research principles that include issues of informed consent,

privacy, anonymity and confidentiality were observed. Chapter 4 entails data analysis and interpretation of the quantitative and qualitative results obtained from the survey.

Chapter 4 will deal with the narrative of data analysis and the interpretation of the data thereof. Qualitative data will be analysed first and then subsequently the quantitative data. Any quantitative data exploration will also be conducted where there are observable results that need further statistical analysis. During interpretation, there will be some form data triangulations to provide a cohesive and critiqued result that answers the research questions.

CHAPTER 4:

ANALYSIS AND INTERPRETATION OF RESULTS

4.0 Introduction

The purpose of the study was to investigate ICT-enhanced teaching and learning in Inclusive Schools by exploring ICT-related factors that contribute to the provision of ICT-enhanced teaching and learning. This investigation treated the Inclusive Schools in Johannesburg Central District as a collective, which means that results were presented in a way as to form a contextual understanding not necessarily to have an explicit comparative analogy of the four schools in the case. The main aim of this chapter is to present the findings of the data acquired from the principal semi-structured questionnaire (Section 4.1), document content analysis (Section 4.2) and teachers' survey (Section 4.3). In order to be able to make sound recommendations on the perceptions of the teachers on ICT-enhanced teaching and learning in Inclusive Schools, a semi-structured questionnaire was administered on the principals to determine how the schools changed from mainstream to inclusive education in relation to ICT-enhanced teaching and learning. Document content analysis of the policies was done as a way of triangulating what the principals said in the semi-structured questionnaire.

The chapter starts by reporting on the semi-structured interviews with the principals, then the content analysis of the ICT policies and lastly followed by the quantitative analysis of the teacher ICT perceptions. A description of the constructs and the validity of the teacher instrument through exploratory factor analysis are presented. The hypothesis of the quantitative analysis of the study was to determine the impact of educator demographic characteristics on their ICT perceptions. Determination of the impact of educator demographic characteristics on their ICT perceptions was conducted using independent t-tests and one-way analysis of variance (ANOVA) and the results published in the paper listed under PUBLICATIONS. The relationship between the constructs is then discussed through correlation analysis. The empirical findings of the study are presented in the following sections.

4.1 Results from the Principals semi-structured questionnaire

Four principals from the Inclusive Schools representing School A-D were administered a Principals' Questionnaire (Appendix E). Prior to questionnaire administration, there were candid background seeking conversations with them to capture an understanding of the journey from mainstream schools to Inclusive Schools. The principals completed the questionnaire in

their own time and the researcher returned to the schools to collect the completed questionnaires. The questionnaire was structured around the study's sub-questions on School ICT infrastructure, School ICT policy, ICT Community support, Continued Teachers' Professional Development and Inadequacies they have identified in their schools. The researcher then went back after some months to do in-depth interviews with the principals to determine whether some issues had changed. The data were captured in an Excel spreadsheet. Following is the analysis of the responses received from the principals.

4.1.1 ICT Infrastructure

The following sub-sections inform of the responses from the principals on questions relating to ICT Availability, ICT Support, ICT maintenance, and Teacher ICT professional development in ICT.

4.1.1.1 ICT Availability

In the school, how many of the devices below were used for educational purposes?

Analysis of the results found that there are 44 desktop computers without internet access, four laptops, some with Internet access and others without Internet access, two school-provided mobile phones, one digital camera and one data projector which were used for educational purposes in Inclusive Schools within Johannesburg Central District. The researcher got the sense of frustration from the principals with having ICT infrastructure that is not serving a purpose because of being offline. This resulted in some principals not able to provide quantifiable responses of their ICT infrastructure. There is no availability of interactive/smart whiteboards, which are 'essential in these days' according to the MEC of GDE (DBE, 2015).

Approximately, what proportion of this equipment (computers, interactive/ smart whiteboards, laptops, data projectors) is fully operational this year?

School A had 76-90% of their equipment in operation; School B had 50-79% while School C had less than 50% of operational ICT. However, School D could not quantify the operational levels of their ICT infrastructure. This informs that these ICT resources have not been in optimal operation during the year and therefore, ICT-enhanced teaching and learning has been compromised.

How many computers or laptops are installed for educational purposes for pupils to use either alone or with a teacher in the following learning spaces? School Laboratory or Other locations not accessible to students

In answering this question principals in School B and D responded that the ICT resources for teaching and learning are found in the *computer laboratory*, while in School A, there were only 40 Tablets found *in other locations not accessible to students*- the storeroom. It is of concern that schools can be provided with ICT for educational purposes but owing to operational challenges they remain unusable. Availability of ICT resources is a critical component to ICT-enhanced teaching and learning but more critical is their accessibility and usability (GIZ Science to Policy Brief, 2016).

By which of the following means does your school mainly have access to the Internet?

These Inclusive Schools receive their Internet via ADSL, 3G, Satellite, and wireless LAN, respectively. This availability mentioned is for administrative functions. Therefore, the availability of the Internet in schools affords continuous access to informative content that the schools can access to impact on providing ICT-enhanced teaching and learning. None of the schools indicated having access to Wi-Fi. According to Government Gazette No.37081 point 16 1 and 2 (p18), a school must have some form of electronic connectivity. This connectivity can be wired or wireless and should at least facilitate communication. Internet facilities are among the communication facilities that a school must provide. Inclusive Schools must have access to the Internet. Even though the Internet may be available for administrative functions, this cannot be viewed as influencing ICT-enhanced teaching and learning.

4.1.1.2 ICT Support

Does your school have an ICT coordinator?

Only three Inclusive Schools have an available ICT coordinator. In one of the schools, the coordinator is available full-time. In two schools, this coordinator also assists and supports the schools on how to use ICT in teaching and learning. According to the national policy, a school must have an ICT co-ordinator (White Paper: on e-Education 2004).

4.1.1.3 ICT Maintenance

Who maintains the ICT equipment in your school?

Maintenance of ICT resources is vital to ascertain that ICT-enhanced teaching and learning for all types of learners is not inhibited. School A has its own staff member maintaining the school's ICT resources while also using the ICT services arranged by the education district authority. School A also depends on assistance from *an external unit arranged by the educational authority* and "Other" ways of ad hoc assistance known to them. They also have other means of making sure that their ICT is maintenance. School B is not performing any maintenance function on their ICT, especially on the computers for educational purposes because the education authority (Gauteng Online Project) arranged the procurement, implementation and maintenance of the resources. School C relies on their *Appointed staff member* and on 'O*ther*' means of ad hoc assistance from elsewhere. School D solely relies on the services of a *Contracted company by the district educational authority*. None of the schools uses external contracted private companies that they have sourced themselves, perhaps owing to cost implications.

4.1.1.4 Teacher ICT Professional Development

During this school this year, did your school have any of the following- school website, e-mail for 50% of staff?

School website

None of the Inclusive Schools have an active website. If a school has limited Internet access, they may not be able to have an active school website. Having an active school website means that the school is reachable. Some materials can be posted on the school website - material that the community who have learners with barriers can access after-hours for further study or practice.

E-mail for staff members

In these Inclusive Schools, A, C and D had provided e-mail connections and access to 50% of their staff members. When staff members and educators are provided with access to e-mail, this opens up opportunities for their own professional development.

In the past two school years, what percentage of your teachers has undertaken professional development in the following?

Introductory courses on internet use: In one school, no teachers had attended such training; in another school <25% had attended such training; yet in another school >50% of the teachers had attended such training. This indicates that there is a great need for teacher training on Internet use.

Equipment specific training (interactive whiteboard, laptop, etc.): One school had none of its teachers having attended such training. In another only <25%, and in another between 26-50% had attended. This indicates that about 25% of teachers had attended training on the use of ICT equipment like laptops, interactive whiteboards etc.

Courses on the pedagogical use of ICT in teaching and learning: Two schools had <25% of teachers who attended such training while the other two schools had none. This reflects that teachers' ICT professional development is lacking, especially in learning how to use ICT in pedagogy.

Courses on multimedia (using digital video, audio equipment, etc.): Attendance was very poor. Less than 25% of teachers have attended such training. This reflects that teachers may not be conversant with latest technologies that they might need in inclusive classrooms and to enhance ICT-enhanced teaching and learning.

Participation in peer learning communities or group work with other teachers about the use of ICT for learning and teaching: Two schools had some form of training in peer learning; yet in another school none of teachers had such opportunities.

Other professional development opportunities related to ICT*:* One school had no other opportunities for ICT development whereas in another between 26-50% of teachers had such opportunities - these opportunities were provided for by the educational department.

What level of benefit do you perceive the following ICT can have in your school to enhance ICT-enhanced teaching and learning?

Using the scale of *Most beneficial*, *Less beneficial and Least beneficial*, the principals were asked to rate some ICT to indicate the level of perceived benefit that they may have in these Inclusive Schools. All schools were unanimous in their perception that having a smart phone, Internet, tablets, educational software for learners with barriers and laptops were *Most Beneficial* in their inclusive environments. Interactive whiteboards, desktop computers and laptops were also perceived as *Most beneficial* by three schools. Inclusive Schools buttress that Internet access, tablets, smart phones, interactive whiteboards, desktop computers, laptops, and educational software for learners with barriers would benefit these inclusive teaching and learning environments.

4.1.1.5 Summary of ICT Infrastructure

Principals were questioned on the availability, support and maintenance of their ICT infrastructure. It was found that ICT infrastructure in Inclusive Schools within Johannesburg Central Region was scanty and not in use. Internet access for teaching and learning was not available.

Support

ICT support is vital in the school. Such support comes in the form of personnel who are vested in ICT matters and coordinates all ICT tuition matters for the school. This coordinator must be able to teach, staff members, and guide staff members on pedagogical training on integrating ICT in teaching and learning (Tubin & Chen, 2002). This employee should ideally be both educationally and technically skilled. These schools have such coordinators available and this is in line with what the White Paper demands.

Maintenance

Figure 4.1: below captures how Inclusive Schools maintain their ICT infrastructure.

	School staff	External contracted company	External unit arranged by educational authorities	Other
School A	1		1	1
School B				
School C	1			1
School D			1	
Total	2	0	2	2

Figure 4.1 Inclusive Schools ICT infrastructure maintenance

School A and C use two options while School C uses one option, which is the default standard where the Educational Authority procures ICT maintenance service providers. School B could not inform on their ICT maintenance because their infrastructure has been unused for a long time.

4.1.2 School ICT Policy

Principals were asked to respond with *yes, no* or *partially* to the following questions that relate to school ICT policy

Does your school have an existing ICT policy?

Two principals have indicated that their schools have an existing ICT policy. School B indicated that there is no ICT policy available owing to "the fact that our computer classes have been off-line for quite some time" [sic] and the other school indicating *Partial* existence because "The policy need to be reviewed in order to suit the needs of the school properly" [sic]. ICT policy must drive ICT use in the school and not the other way around. With a view that there is a need to review the school's ICT policy to accommodate the current needs of the Inclusive Schools means that school leadership wants to implement the standards set out by the Department of Education (White Paper, 2004).

Does your ICT policy specify the use of ICT for teaching purposes?

Two of the schools have indicated that their ICT policy does specify the use of ICT for teaching purposes while the other two said no. This is crucial as it indicates the level of accountability and commitment to ICT-enhanced teaching and learning. ICT policy must clearly specify the what, how and where of ICT in teaching and learning.

Does your ICT policy specify the use of ICT for teaching learners with barriers / Special Needs?

One school indicated that it has an inclusive ICT Policy. According to the principal, "the policy provides for all learners." Another principal said that their ICT policy *Partially* caters for teaching learners with barriers or Special Needs. Principals had different views on the inclusivity of their ICT policy whether it caters for learners with Special Needs. They commented that their "ICT Policy- Based on GOL [Gauteng Online] and learners with Special

Needs not included." Gauteng Online (GOL) was the Educational Authority ICT initiative to provide computers in schools. According to the principal, GOL was not geared to providing ICT for all types of learners. Another one explained that they "do not have software that accommodates Learners with Special Needs." This means that an ICT policy exits but may not cater for learners with Special Needs. At another school, the principal emphasised that their ICT policy "needs to be reviewed" indicating that there is an identified need to change their school ICT policy to be inclusive by catering for the teaching and learning of Special Needs learners. One school principal said that their ICT policy Partially specifies the use of ICT for teaching Special Needs and learners with barriers - "provides for all learners."

Does your ICT policy specify the use of ICT to provide learning for special needs learners?

A questioned was posed to the principals to enquire about the policy provision specific to learning for learners with Special Needs. It was answered that their policy was not specific with regards to learners with Special Needs because the "ICT Policy was based on GOL [*Gauteng Online*] and special learners are not included". Another principal mentioned that it is not specific because "We do not have any software that accommodates learners with special needs". In another school, the principal made reference that policy is *Partially* specific and mentioned that "the policy provides for all learners but needs to be reviewed". Another principal mentioned that "N/A".

Is your school's ICT policy inclusive (caters for all types of learners)?

When asked whether the ICT policy caters for the learning of all type of learners (inclusivity), one principal explained that "only mainstream learners" are catered for in their policy and another informed that their school ICT policy partially caters for all types of leaners but emphasised that it "need [sic] to be reviewed and refined". The recurrent theme of ICT policy needing to be reviewed was prevalent.

Does your school ICT policy specify the use of school ICT infrastructure for community support?

One principal responded that their policy does not specify the use of school ICT infrastructure for community support and commented that the "Community is not considered." Another principal responded that "there is no person or individual that can assist in this area." The third

principal responded that “It doesn’t include community support because we have tablets not the workstations, the classroom that was used as a lab is now the normal classroom due to lack of space.” Only one principal responded that their school ICT policy does cater for community support and commented that “It is one of the best way [sic] of building up relations between stakeholders.” Therefore, the principals indicated that community was not considered for using school ICT infrastructure owing to space issues that inhibit the community from accessing these ICT resources. One principal seemed to be looking into the future by looking at building relations with community members.

ICT policy specific for Teacher Professional Development

Two principals responded that their ICT policy does *Partially* specify the use of school ICT for teacher ICT professional development but that “teachers are incorporated in ICT”. However, they also observed that the policy “needs to be reviewed” to support teachers’ professional development. School ICT policy must drive any strategic ICT implementation. Schools must “own” their policy and implement it. This means that, as most ICT implementation strategies are top-down from Educational Authority to the schools, policies are usually also top-down. This means that the school may not have ownership of the policies they are implementing. The other school indicated that their ICT does not specify the use of school ICT for teacher’s professional development. One school has an ICT Policy that caters for teachers’ professional development although the principal’s comment was that “teachers need to be incorporated in ICT.” In the other three schools, the ICT policy does not speak to the educators’ professional development needs to promote ICT-enhanced teaching and learning. One principal again emphasised the previous sentiment of the need to review and refine their ICT policy.

4.1.2.1 Summary of School ICT Policy

Principals were asked to comment on their school ICT policy from its existence, inclusivity for all learners, inclusivity for teacher ICT professional development to inclusivity that caters for the community. With the paucity of research on the intersection of ICTs, education and Inclusion (GIZ Science to Policy Brief, 2016), the research purposed to find a medium to be able to grasp the extent of the problem. There is an inadequacy of school ICT policy that drives ICT-enhanced teaching and learning. Where ICT policy exists, it is highly in “need of review” to cater for teaching and learning all types of learners. ICT policy that drives ICT-enhanced

teaching and learning must also cater for teachers' professional development needs. ICT community support as stipulated in the DoE's White Paper should be clearly incorporated into school ICT policy to enforce compliance.

4.1.3 ICT Community Support

The notion of making school ICT resources available for community use is one of the e-Education goals as stipulated in the Department of Educations' policy (DoE, 2004). Community support in this instance refers to the accessibility of ICT resources for extra-curricular activities of teaching, learning and information access. Parents of learners with Special Needs, for example with Autism, can be given access to school ICT resources to learn with their children after hours, to gather other information pertinent to their challenges and also garner support from others who are experiencing the same circumstances. Five questions were posed to the principals with regards to this aspect and the analysis of their responses follows.

Is your school ICT infrastructure made available to the community for use after school hours?

Only one principal, out of the four, was of the opinion that their school has provided access to school ICT resources for community support. Principals from the other three schools emphatically gave reasons for why their schools do not offer ICT Community Support sighting reasons of "*for safety and security purposes* [sic]", "*GOL [Gauteng Online] would not allow community to use those computers [sic]*" and "*The school has no computers after all 25 computers were taken by thieves.*"

From these responses above, it is evident that there are two key issues that would need to be addressed for these Inclusive Schools to offer ICT Community Support in support of ICT-enhanced teaching and learning for all types of learners: safety and security of ICT resources and the adapting ICT policies that govern their use and who is responsible from it whether it is the private sector or government.

Would your school ICT infrastructure be made available after hours to support learners with barriers and special needs from your school?

Principals from three schools responded positively with a YES to the question and further commented that:

- "*Provided we control those resources*";
- "*There should be string (sic) monitoring and accountability*"; and
- "*It's a good way of strengthening partnerships with stakeholders, and more time will be made available to support such learners*"

There seems to be a positive view from the principals that school ICT resources could be used for after-hours support to learners with barriers or Special Needs that come from their schools. The other principal, who answered with a NO, cited the issue of the ICT resources being currently "offline" (This is a service provided by GOL [Gauteng Online]). Learners who attend these Inclusive Schools can benefit from after-hours support provided that the ICT resources are available and accessible e.g. are online. According to the e-Education White Paper (2004), access to ICT resources after hours is also a key element for schools that are implementing ICT-enhanced teaching and learning to promote community support.

Would your school ICT infrastructure be made available after hours to support learners with barriers and special needs from the community?

There were varying views with regards to ICT Community Support for with barriers or Special Needs from the community, who do not attend as day-scholars at these Inclusive Schools. Only one principal responded with a YES and emphasised an earlier point that this would "*be a good way to strengthening partnerships with stakeholders [sic]*." Two principals mentioned "*security and safety of the resources*" and "It would be difficult but prior arrangements should be made so that the SGB and ICT Committee is informed" as reasons. The fourth principal cited their ICT resources as being "*offline*" as the reason for not availing their school ICT infrastructure for community support. Unavailable ICT does not only school users but of the community that may benefit from it also.

The concern over safety and security seems to be a recurring theme that poses an obstacle to the provision of ICT-enhanced teaching and learning in Inclusive Schools. It seems opening to the general community i.e. learners and their parents or guardians who are not day-scholars at these Inclusive Schools may pose a threat to safety and security of resources. However, one principal was willing to offer prior notification and arrangements through the school's leadership structures. Once more, the unavailability of ICT infrastructure i.e. being off-line is

a recurring theme. Therefore, this would need to be addressed if ICT-enhanced teaching and learning for all types of learners is a goal.

Would your school ICT infrastructure be made available after hours to support your educators? E.g. ICT training, Professional Development relevant to the inclusive environment

The principals are of the view that ICT resources could be made available after- hours as a platform for teacher ICT professional development through ICT training for their educators. This is emphasised by the notion from one of the principals that "I think that will play a big role in educators teaching practice", which is a very critical skill for the modern educator. Another view was that this could not be possible as the ICT resources or "the lab is off-line." Non-availability of resources poses a threat for teacher professional development. This is critical where only <50% have attended ICT classes.

Which days of the week could your school ICT infrastructure be used for community support?

Principals indicated that ICT Community Support cannot happen at all, during Monday-Friday after school hours, alternate days of the week after school hours but rather during school holidays and Saturdays. ICT-enhanced teaching and learning cannot be extended as ICT Community Support for with barriers or Special Needs during normal academic timeframes but rather on Saturdays and school holidays. This is still a positive step in the direction of accommodating learners with Special Needs like Autistic learners who can access school ICT resources on Saturdays and school holidays for learning. One principal emphasised that "The partnerships between the school and the community should be natured to grow in strength so that the school may benefit from their support."

Contrasting to this positive stance, two principals indicated that ICT Community Support cannot happen at all. Principals had indicated that "*security and safety of the resources*" is a concern as well as resources being "*off-line*."

4.1.3.1 Summary of ICT Community Support

One principal summed that it is ideal for provide ICT Community Support after hours because "*Schools should act a "Community builder*", hence, the community should be able to get access even after hours." Although Saturdays and school holidays are the ideal times, this may still

not be viable largely owing to security reasons and resources being off-line. Therefore, education authorities need to support schools with measures on how to make school ICT accessible to the community without compromising school security. Even though this may be beneficial to communities with barriers or Special Needs, the needs to be a balanced operational model that would consider all these matters.

4.1.4 Inadequacies in Inclusive Schools

Indicate how far your school's capacity to provide ICT-enhanced teaching and learning was affected by a shortage or inadequacy in the following areas:

All the principals agree with the following four issues as their major inadequacies that hinder them from offering ICT-enhanced teaching and learning in their Inclusive Schools:

- *Internet / bandwidth;*
- *Teacher's ICT skills;*
- *School space organisation (classroom size and furniture); and*
- *School security concerns with theft of ICT hardware.*

Out of the four top concerns, three are related to ICT. Internet connectivity issues are key as alluded to in (Section 4.1.1.1). Internet connectivity is a policy mandate from the Department of Education (e-Education White Paper, 2004). Internet connectivity includes any other contracted services that the education authorities have procured for the provision of school technology. Inclusive Schools thrive on this as they provide teaching and learning for learners with variable needs. According to the DBE, about 265 of teachers have basic ICT skills, while only 7% possess intermediate skills in using ICT for teaching and learning (DBE, 2016). When teachers' ICT skills are indicated as an inadequacy, it means that no matter how accessible the technology is for ICT-enhanced teaching and learning, if the teachers are not skilled to teach using the ICT, it will be a futile exercise. This promotes the "white elephant" scenario in schools where at times ICT may gather dust or be placed in storerooms owing to non-use. Moreover, school security concerns threaten the motivation for ICT-enhanced teaching and learning. The great threat posed by theft of school ICT infrastructure brings fear and this impacts on any measures taken to provide ICT-enhanced teaching and learning. In fact, theft and attempted theft of ICT contribute to diminished interest in pursuing ICT-enhanced teaching

and learning and this becomes a draw-back- as exemplified with one school that had 40 Ipads that are not utilised in the school but are merely in the storeroom gathering dust (Section 4.1.1).

The next areas of concern related to ICT that the principals indicated were that:

- *School computers out of date and needing repairs, or they are offline;*
- *[Limited] Number of Internet-connected computers;*
- *Lack of content/material to use in teaching and learning;*
- *[Limited] number of computers;*
- *Challenges with integrating ICT use into the curriculum; and*
- *Lack of teaching models on how to use ICT for learning.*

From the above, it is evident that there is a stark need for usable and available ICT and the skilling of educators on how to provide ICT-enhanced teaching and learning.

Most of the principals were of the perception that most parents and teachers preferred the use of ICT at school, and that there are clear benefits in the use of ICT in teaching and learning. One principal felt strongly that "no or unclear benefit to use ICT for teaching" was a hindrance to their school (an inadequacy) providing ICT-enhanced teaching and learning. This was a strong sentiment as it has influence on having ICT policy, ICT coordinator, provision of ICT for community support, and the commitment to teacher ICT professional development.

In Section 4.2, we will report on the content analysis of the actual school ICT policies that were collected by the researcher from the principals. The purpose was to scrutinize the ICT policies to understand whether they are adequate to drive ICT-enhanced teaching and learning in Inclusive Schools.

4.2 School ICT Policy Content Analysis

Four schools were approached to provide ICT policies, which were going to be analysed based on set criteria. Three policies were received from three schools. One school did not provide an ICT policy. The policies were scrutinized based on the following research matrix developed specifically for this study as indicated in (Section 3.4.2 Table 3.4). Content analysis of the actual policies was conducted (see Appendix F). This was to triangulate data with the

principals' views on their school ICT policies. Triangulation of principals' views on their own ICT policies and content analysis of the ICT policy documents collected was done as follows:

Does your school have an existing ICT policy?

Principals had informed that they do have ICT policies. This was confirmed by three ICT policies received from four schools. On further perusal of the ICT policies, it was discovered that they were speaking to different audiences and for different purposes. A school can have one ICT policy that encompasses all the necessary detail of how ICT is used in the school or a school can have various ICT-related policies that speak to different aspects e.g. ICT in the Classroom, ICT procurement, ICT security, ICT and staff development etc. With the three policies obtained, only one encompassed the entire role of ICT in the school and it was individualised to the needs of the school because it was developed by the school. The other two were development and provided by the ICT service provider and the GDE - the school had no input. For ICT to drive ICT-enhanced teaching and learning, the school itself must drive its own policy development and implementation.

Does your ICT policy specify the use of ICT for teaching purposes?

A questioned was posed to the principals on the specificity of the policy to the use of ICT for teaching purposes in the school. Two principals responded that "Yes" and the other two principals responded with a "*No*". ICT-enhanced teaching and learning requires ICT infrastructure dedicated for teaching.

Does your ICT policy specify the use of ICT for teaching with barriers / Special Needs?

From analysis of the policies, the use of ICT for teaching learners with Special Needs is not specified. The policies were inadequate because they were provided by the service provider and the education authorities for specific subject use e.g. Maths Literacy.

Does your ICT policy specify the use of ICT to provide learning for special needs learners?

There is a generic understanding and use of ICT in these Inclusive Schools. The ICT policy is not leading the strategic ICT-enhanced teaching and learning.

Is your school's ICT policy inclusive (caters for all types of learners)?

The school ICT policies analysed do not speak to the inclusive nature of the schools. The principals responded that "*No, it only caters for mainstream learners*". Another principal said that "*It is not applicable to them*". The principal who said "*Partially*" mentioned that "*It needs to be reviewed and refined*".

Does your school ICT policy specify the use of school ICT infrastructure for community support?

Principals had differing views about allowing access to school ICT infrastructure for use by the community. Their policies reflect this view. The policy does not specify the use of school ICT infrastructure for community use. One school had a positive outlook on providing the community with access to school ICT but their policy document did not reflect this view. Schools must implement what their ICT policy says - there must be coherence.

ICT policy specific for teacher professional development

ICT policies are very vague on the use of school ICT infrastructure for teacher professional development. One policy mentioned the use of computers with e-mail communication for teachers; this is not adequate. School ICT infrastructure should be used in various scenarios - not just communication. Training for ICT-enhanced teaching and learning can also be facilitated using the same school ICT infrastructure. Policy must enshrine the teachers' right to appropriate ICT training. Inclusive Schools need robust ICT support and infrastructure to which their educators must be highly equipped to use. Professional development must be at an intermediate level, i.e., above basic computer literacy. Educators and teachers need to develop their ICT skills, which will enhance and allow them to be able to teach learners with diverse needs who may need to use specialised ICT equipment.

In the following Section 4.3, the research will report on the quantitative results of Teacher ICT Perceptions.

4.3 Results from the Teacher Questionnaire

Seventy-eight educators participated in the study out of a total of 127 educators, giving a response rate of 61%. This response rate was much higher than the average response rate of 52.7% with a standard deviation of 20.4 obtained from data collected from individuals as

reported by Baruch and Holtom (2008) in 490 different studies published in the year 2000 – 2005 that utilised surveys in 17 refereed academic journals. Therefore, the response rate is deemed acceptable. The term "educators" and "teachers" were used interchangeably. School Governing Body (SGB) members School Management Team (SMT) members were also included in the study because some have teaching time in class and or were computer specialists. The characteristics of the sample are shown in Table 4.1.

Table 4.1: Characteristics of the sample

Variable	Category	Frequency	%
School	A	28	35.9%
	B	17	21.8%
	C	19	24.4%
	D	14	17.9%
	Total	**78**	**100.0%**
Age group	25 - 34 years	10	13.2%
	35 - 44 years	22	28.9%
	45 - 54 years	31	40.8%
	55 - 64 years	13	17.1%
	Total	**76**	**100.0%**
Gender	Female	70	89.7%
	Male	8	10.3%
	Total	**123**	**100.0%**
Teaching experience	1 - 5 years	15	20.0%
	6 - 10 years	11	14.7%

Table 4.1: Characteristics of the sample			
Variable	**Category**	**Frequency**	**%**
	11 - 20 years	26	34.7%
	More than 21 years	23	30.7%
	Total	**73**	**100.0%**
Years in the current Position	1 - 5 years	35	47.3%
	6 - 10 years	11	14.9%
	11 - 20 years	20	27.0%
	More than 21 years	8	10.8%
	Total	**74**	**100.0%**
Current role	Educator	57	73.1%
	Learner support educator	9	11.5%
	Administrator	12	15.4%
	Total	**76**	**100.0%**
Professional qualification	3 year diploma + teacher experience	41	53.9%
	Bachelor's degree	6	7.9%
	Bachelor's degree + teacher experience	28	36.8%
	Master’s degree	1	1.3%
	Total	**76**	**100.0%**

As mentioned earlier, there were four schools. About 35.9% (n=28) were from School A, 21.8% (n=17) from School B, 24.4% (n=19) from School C, and 17.9% (n=14) from School D.

The majority of the respondents were above 44 years. The largest proportion of respondents were aged 45 - 54 years with a proportion of 40.8% (n=31) followed by those aged 35 – 44 years with a proportion of 28.9% (n=22). Therefore, close to 70% of the respondents were aged between 35 – 54 years. This is in line with national figures where the majority of the workforce were middle aged (Statistics South Africa: Quarterly Labour Force Survey, Quarter 3: 2020) and CDE (2015) indicates the age profile as between 40-49 years. Teacher age many not be a concern for technology use. As Becta (2004; 2007) and Scrimshaw (2004) in Morley (2011, p7) contend, the more 'experienced older teachers have the ability to identify areas where computers can support and extend teaching and learning'.

The ratio of females to males is 9 is to 1. Therefore, close to 90% (n=70) are females while 10.3% (n=8) were males. The gender composition is not representative of the South African Workforce where 56.4% were males while 43.46% are females (Statistics South Africa: Quarterly Labour Force Survey, Quarter 3: 2020). However, it is in agreement with the feminisation of the teaching profession (UNESCO 2011).

The majority of the respondents had more than ten years' experience. The largest proportion, that is, 34.7% (n=26) had 11 – 20 years' experience and 30.7% (n=23) were more than 21 years. Only 34.7% (n=26) had at most ten years of experience. It can be concluded that the teachers were very experienced. Morley (2011) found that teacher experience has more influence on teacher's use of technology in the classroom more that age and gender.

Close to half, that is, 47.3% (n=35) had at most 5 years in their current position, 14.9% (n=11) had 6 -10 years, 27% (n=20) had 11 – 20 years while 10.8% (n=8) had more than 21 years. Therefore, the majority of the educators had at most ten years in their current position.

The majority of the respondents, that is, 73.1% (n=57) were educators, 15.4% (n=12) were administrators like HoDs and deputy principals and 11.5% (n=9) were learner support educators.

In terms of professional qualifications, 53.9% (n=41) had a 3 year diploma with teacher experience, 36.8% (n=28) had a bachelor's degree with a teacher experience. Close to 7.9% (n=6) had only bachelor's degree while 1.3% (n=1) had a Master's degree. Therefore, very few people do not have teaching experience. According to CDE (2015), 81% of the teaching corps, 66% had M+3 and 15% had M+4) were qualified.

4.3.1 Descriptive statistics of the dimensions

Nine composite variables were created by averaging the items in each dimension. The dimensions were measuring teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement. The dimensions were

- Teacher competence;
- Teaching using ICT;
- Curriculum enhancement;
- ICT in education;
- Type of delivery method beneficial in receiving ICT training;
- Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students;
- Level of benefit perceived of ICT device in teaching in inclusive environments; and
- Level of use of ICT devices.

The descriptions of the dimensions are discussed in the following sub-sections.

4.3.1.1 Descriptive statistics on issues on teacher competence

As mentioned earlier, the aspects were measured on a four-point Likert scale, ranging from 1 strongly disagree to 4 strongly agree. There were five statements measuring teacher competence. The interpretations of the average were that a mean of less than 2.5 meant that the respondents were in disagreement while a mean of at least 2.5 meant that the respondents were in agreement.

The levels of agreements are shown in Table 4.2.

Table 4.2: The level of agreement on issues on teacher competence					
Statement	**Level of agreement**				**Mean**
	Strongly agree	**Agree**	**Disagree**	**Strongly disagree**	
Q7b. It is very important for me to learn how to use ICTs.	56.0% (42)	41.3% (31)	-	2.7% (2)	3.51
Q7c. Learning to operate ICTs is like learning any new skill - the more you practice, the better you become.	50.7% (36)	45.1% (32)	2.8% (2)	1.4% (1)	3.45
Q7a. Knowing how to use ICT is a worthwhile skill.	41.3% (31)	46.7% (35)	9.3% (7)	2.7% (2)	3.27
Q7e. I am confident with my general ICT knowledge for example typing documents and using the Internet.	24.7% (18)	53.4% (39)	17.8% (13)	4.1% (3)	2.99
Q7d. Working with ICT makes me feel tense and uncomfortable.	1.4% (1)	12.5% (9)	58.3% (42)	27.8% (20)	1.88

All the aspects had average at least 2.5 and levels of agreement of more than 75%, indicating that the respondents were in agreement except the aspect "*working with ICT makes one feel tense and uncomfortable*". Therefore, about 86.1% (n=62) were in disagreement that working with a computer makes one tense and uncomfortable. Furthermore, 97.3% agreed that it is very important for them to learn how to use ICTs, 95.8% agreed that learning to operate ICTs is like learning any new skill - the more one practice, the better they become. About 87% agreed that knowing how to use ICT is a worthwhile skill and 78.1% were in agreement that they are confident with their general ICT knowledge for example typing documents and using the Internet.

4.3.1.2 Descriptive statistics on issues on teaching using ICT

There were five statements assessing teaching using ICT respondents measured on 5-point Likert scales ranging from 1 strongly disagree to 4 strongly agree. Strongly agree and agree were collapsed together to give the agreement level while strongly disagree and disagree were taken as those in disagreement. A mean of at least 2.5 and above meant respondents were in agreement while a mean below 2.5 meant there were in disagreement. The information is shown in Table 4.3.

Table 4.3: The level of agreement on issues on teaching using ICT

Statement	Level of agreement				Mean
	Strongly agree	Agree	Disagree	Strongly disagree	
Q7j. My teaching style can change when I integrate technology.	31.0% (22)	42.3% (30)	15.5% (11)	11.3% (8)	2.93
Q7g. Capable teachers do not need ICT to teach efficiently.	6.8% (5)	2.7% (2)	50.7% (37)	39.7% (29)	1.77
Q7i. Using ICT can prevent me from being creative in teaching.	5.6% (4)	11.3% (8)	36.6% (26)	46.5% (33)	1.76
Q7h. Computers will only put more work on the shoulders of the teachers.	5.7% (4)	4.3% (3)	37.1% (26)	52.9% (37)	1.63
Q7f. Learning to use ICT in teaching is a waste of time.	2.7% (2)	1.4% (1)	40.5% (30)	55.4% (41)	1.51

About 73% of the respondents were in agreement that their teaching style can change when they integrate technology. However, the respondents were in disagreement on the following issues:

- Learning to use ICT in teaching is a waste of time (95.9%).
- Capable teachers do not need ICT to teach (90.4%).
- Computers will only put more work on the shoulders of the teachers (90.0%).
- Using ICT can prevent me from being creative in teaching (83.1%).

Therefore, the respondents felt that the teachers are in need of ICT.

4.3.1.3 Descriptive statistics on issues of curriculum enhancement

The respondents were asked to indicate their level of agreement on five aspects about curriculum enhancement.

The levels of agreement as mentioned before was used and the information is given in Table 4.4.

Table 4.4: The level of agreement on issues on curriculum enhancement

Statement	Level of agreement				Mean
	Strongly agree	Agree	Disagree	Strongly disagree	
Q7k. If some students with learning barriers learn better with computers, that would encourage me to use computers to enhance the curriculum.	49.3% (37)	48.0% (36)	1.3% (1)	1.3% (1)	3.45
Q7n. Using ICT can assist with flexible assessment for learners with barriers.	34.7% (25)	61.1% (44)	2.8% (2)	1.4% (1)	3.29
Q7l. ICT can give me flexibility to transform the	31.9% (23)	63.9% (46)	2.8% (2)	1.4% (1)	3.26

Table 4.4: The level of agreement on issues on curriculum enhancement					
Statement	**Level of agreement**				**Mean**
	Strongly agree	**Agree**	**Disagree**	**Strongly disagree**	
curriculum to suite learners with barriers.					
Q7m. I need ICT to make the curriculum suitable for learners with barriers.	31.9% (23)	61.1% (44)	5.6% (4)	1.4% (1)	3.24
Q7o. The curriculum is very complex therefore ICT cannot assist in making it simpler.	5.8% (4)	10.1% (7)	44.9% (31)	39.1% (27)	1.83

All the aspects had a mean of at least three and level of agreement of more than 90% except the aspect that "*the curriculum is very complex; therefore, ICT cannot assist in making it simpler*", which had a mean of 1.83 and a disagreement level of 84%. The respondents are in agreement that the curriculum is not complex such that ICT cannot assist in making it simpler. About 97.3% agreed that some students with learning barriers learn better with computers, which would encourage the teachers to use computers to enhance the curriculum. In addition, 95.8% agreed that using ICT can assist with flexible assessment for learners with barriers. Similarly, 95.8% agreed that ICT can give me flexibility to transform the curriculum to suite learners with barriers and 93% agreed that they need ICT to make the curriculum suitable for learners with barriers.

4.3.1.4 Descriptive statistics on issues of ICT in education

In terms of ICT in education, the respondents were asked to indicate their level of agreement on five aspects. The levels of agreement as used before are shown in Table 4.5.

About 94.3% were in agreement that ICT can make teachers more flexible in teaching, 93.1% agreed that ICTs are necessary for quality education, 86.9% agreed that ICT could enhance

remedial instruction. However, 66.6% agreed that their school computers offer them knowledge and information that assists in teaching while, 75% disagreed that the school budget was limited and upgrading ICT should not be an urgent priority.

Table 4.5: The level of agreement on issues on ICT in education

Statement	Level of agreement				Mean
	Strongly agree	Agree	Disagree	Strongly disagree	
Q7q. Using ICT can make teachers more flexible in teaching.	39.4% (28)	54.9% (39)	5.6% (4)	-	3.34
Q7p. ICTs are necessary for quality education.	38.9% (28)	54.2% (39)	2.8% (2)	4.2% (3)	3.28
Q7s. ICT could enhance remedial instruction.	15.9% (11)	71.0% (49)	13.0% (9)	-	3.03
Q7r. Our school computers offer me knowledge and information that assists in teaching.	13.0% (16)	53.6% (37)	23.2% (16)	10.1% (7)	2.70
Q7t. When school budget is limited, upgrading ICT should not be an urgent priority.	9.7% (7)	15.3% (11)	44.4% (32)	30.6% (22)	2.04

4.3.1.5 Descriptive statistics on issues of type of delivery method beneficial in receiving ICT training

The respondents were asked to indicate the type of delivery method that they believe would benefit them most in receiving ICT training. A three-point Likert scale was used from 1 most beneficial to 3 least beneficial. The information is shown in Table 4.6.

The majority of the respondents indicated that the aspects were not beneficial. About 41.7% indicated that *Out of District training* is least beneficial. On the contrary, 60.9% agreed that in-school building level training is least beneficial, 70.6% indicated that *District level in-service training* is least beneficial and 71.9% indicated that *coursework at college/university* was least beneficial.

Table 4.6: The level of agreement on issues on type of delivery method beneficial in receiving ICT training

Statement	Level of benefit			Mean
	Most beneficial	Less beneficial	Least beneficial	
Q8b. Out of District training	18.3% (11)	40.0% (24)	41.7% (25)	2.23
Q8d. In-school building level training	12.5% (8)	26.6% (17)	60.9% (39)	2.48
Q8a. District level in-service training	7.4% (5)	22.1% (15)	70.6% (48)	2.63
Q8c. Coursework at college/university	6.3% (4)	21.9% (14)	71.9% (46)	2.66

4.3.1.6 Descriptive statistics on issues of type of delivery method beneficial in receiving ICT training for teaching and learning of special education students.

The respondents indicated the type of delivery method they believed would benefit most in receiving training regarding using ICT for teaching and learning of special education students. A three-point Likert scale that ranged from 1 most beneficial to 3 least beneficial was used. The information is shown in Table 4.7.

The same pattern observed in type of delivery method that one can receive in ICT training was also observed in ICT training and learning of special education students. The majority of the

respondents also indicated that the aspects were not beneficial. About 40.4% indicated that Out of District training is least beneficial, while 69.5% indicated that coursework at college/university was least beneficial. On the contrary, 70.7% agreed that in-school building level training is least beneficial and 71% indicated that district level in-service training is least beneficial.

Table 4.7: The level of agreement on issues on type of delivery method beneficial in receiving ICT training for teaching and learning of special education students

Statement	Level of benefit			Mean
	Most beneficial	Less beneficial	Least beneficial	
Q9b. Out of District training	14.0% (8)	45.6% (26)	40.4% (23)	2.26
Q9c. Coursework at college/university	8.5% (5)	22.0% (13)	69.5% (41)	2.61
Q9d. In-school building level training	6.9% (4)	22.4% (13)	70.7% (41)	2.64
Q9a. District level in-service training	6.5% (4)	22.6% (14)	71.0% (44)	2.65

4.3.1.7 Descriptive statistics on issues on level of benefit perceived of ICT device in teaching in inclusive environments

The respondents indicated the level of benefit they perceived ICT devices can have in teaching in Inclusive Education. A three-point Likert scale ranging from 1 most beneficial to 3 least beneficial was used. The levels of benefit are shown in Table 4.8.

The percentage of devices that were indicated as least beneficial were 46.4% smartphones, 74.6% Internet, 77.6% computer (desktop), 75.4% interactive/Smart whiteboard, 79.4% Tablet e.g. Ipad, 81% laptop and 88.1% educational software for learners with barriers. Therefore, the majority of the respondents indicated that most of the ICT devices are least beneficial.

Table 4.8: The level of agreement on issues on level of benefit perceived of ICT device in teaching in inclusive environments				
Statement	**Level of benefit**			**Mean**
	Most beneficial	**Less beneficial**	**Least beneficial**	
Q10a. Smart phone	28.6% (16)	25.0% (14)	46.4% (26)	2.18
Q10b. Internet	8.5% (5)	16.9% (10)	74.6% (44)	2.66
Q10f. Computer (desktop)	6.9% (4)	15.5% (9)	77.6% (45)	2.71
Q10d. Interactive/Smart whiteboard	3.5% (2)	21.1% (12)	75.4% (43)	2.72
Q10c. Tablet e.g. Ipad	3.2% (2)	17.5% (11)	79.4% (50)	2.76
Q10g. Laptop	4.8% (3)	14.3% (9)	81.0% (51)	2.76
Q10e. Educational software for learners with barriers	8.5% (5)	3.4% (2)	88.1% (52)	2.80

4.3.1.8 Descriptive statistics on issues on level of use of ICT devices

The respondents were to indicate the level of use of ICT devices (see Table 4.9). They were asked to indicate whether it was daily, weekly, monthly, occasionally or not at all. The information is shown in Table 4.9.

Table 4.9: The level of agreement on issues on level of use of ICT devices						
Statement	**Level of use**					**Mean**
	Daily	**Weekly**	**Monthly**	**Occasionally**	**Not at all**	
Q11f. Smartphone	54.7% (35)	7.8% (5)	7.8% (5)	6.3% (4)	23.4% (15)	2.36
Q11d. Internet	44.3% (27)	3.3% (2)	16.4% (10)	26.2% (16)	9.8% (6)	2.54
Q11b. Laptop	42.2% (27)	4.7% (3)	15.6% (10)	25.0% (16)	12.5% (8)	2.61
Q11a. Computer (desktop)	27.4% (17)	6.5% (4)	14.5% (9)	33.9% (21)	17.7% (11)	3.08
Q11g. Tablet e.g. Ipad	26.2% (16)	1.6% (1)	6.6% (4)	29.5% (18)	36.1% (22)	3.48
Q11e. Educational software	11.9% (7)	13.6% (8)	10.2% (6)	32.2% (19)	32.2% (19)	3.59
Q11c. Ipad	21.3% (13)	3.3% (2)	6.6% (4)	24.6% (15)	44.3% (27)	3.67

The proportion that used the ICT devices daily were 55% used the smartphone, 44% used the Internet, and 42% used laptop. Occasionally and not at all were collapsed to determine those who used the devices rarely. Therefore, the proportion who used the devices rarely were 52% computer (desktop), 66% tablet, 64% educational software, and 69% Ipad.

4.3.2 Assessing validity of the instrument using exploratory factor analysis

Exploratory factor analysis was performed using principal component analysis with a varimax rotation. The exploratory factor analysis was done for the following dimensions.

- General ICT perceptions;
- Type for delivery method;
- Level of benefit of ICT devices; and

- Level of use of ICT devices.

The results of the exploratory factor analysis are discussed in the following sections.

4.3.2.1 Factor analysis on issues of general ICT perceptions

There were 20 items measuring general ICT perceptions. However, the item "*ICT could enhance remedial instruction"* was removed from the analysis owing to an insignificant loading resulting in a total of 19 items for the final analysis. The principal component analysis with a varimax rotation resulted in a KMO of .691 and a Bartlett Test of Sphericity with a chi-square of 609.508 and a p-value less than .001. Since the KMO was above .5 and the Bartlett Test of Sphericity indicated sufficient correlation then the solution was appropriate for factor analysis. The lowest communality was .602 and therefore, all communalities were above .5.

The factor analysis resulted in a six factor solution as shown in Table 4.10.

Table 4.10: Factor solution on issues on general ICT perceptions

Factors and observed variables	Loadings	Eigenvalues	% of variance
Factor 1: Curriculum enhancement		3.645	19.19%
Q7n. Using ICT can assist with flexible assessment for learners with barriers.	.922		
Q7m. I need ICT to make the curriculum suitable for learners with barriers.	.921		
Q7l. ICT can give me flexibility to transform the curriculum to suite learners with barriers.	.891		
Q7k. If some students with learning barriers learn better with computers, that would encourage me to use computers to enhance the curriculum.	.802		
Factor 2: Teaching using ICT		3.486	18.35%
Q7h. Computers will only put more work on the shoulders of the teachers (*R).	.930		
Q7g. Capable teachers do not need ICT to teach efficiently (*R).	.906		
Q7i. Using ICT can prevent me from being creative in teaching (*R).	.897		

Q7f. Learning to use ICT in teaching is a waste of time (*R).	.599		
Factor 3: Teacher competence Q7b. It is very important for me to learn how to use ICTs. Q7c. Learning to operate ICTs is like learning any new skill -the more you practice, the better you become. Q7a. Knowing how to use ICT is a worthwhile skill.	 .896 .852 .844	2.603	13.70%
Factor 4: ICT in education- Teaching Q7q. Using ICT can make teachers more flexible in teaching. Q7p. ICTs are necessary for quality education. Q7d. Working with ICT makes me feel tense and uncomfortable (*R).	 .835 .741 .606	2.058	10.83%
Factor 5: ICT in education – Priority Q7t. When school budget is limited, upgrading ICT should not be an urgent priority (*R). Q7r. Our school computers offer me knowledge and information that assists in teaching. Q7e. I am confident with my general ICT knowledge for example typing documents and using the Internet. Q7o. The curriculum is very complex therefore ICT cannot assist in making it simpler (*R).	 .682 -.568 -.532 .532	1.745	9.18/%
Factor 6: Q7j. My teaching style can change when I integrate technology	 .924	1.159	6.10%
Total variance explained			**77.35%**

The factor solution resulted in six factors. The first factor was named "*curriculum enhancement*" had an eigenvalue of 3.745 and it explained 19.2% of the total variance. The factor consisted of the four out of the five items under curriculum enhancement. It conformed to the initial grouping of the items.

The second factor was named "*teaching using ICT*" with an eigenvalue of 3.486 and it explained 18.3% of the variance. The factor had four factors out of the initial five factors and it confirmed the original classifications. The third factor consisted of three items with an eigenvalue of 2.603 and accounting for 13.7% of the total variance. This factor was named "*teacher competence*" since it consisted of three items out of the original five items.

The fourth factor had three items and it was named "*ICT in education*" with an eigenvalue of 2.058 and accounting for 10.8% of the total variance. The factor had three items of the original five items of the factor ICT in education. The fifth factor had three items and it was named "ICT in education – Priority" with an eigenvalue of 1.745 and accounting of 9.2% of the total variance. The sixth factor was not named since it had only one item, which is the item "*my teaching style can change when I integrate technology*". It had an eigenvalue of 1.159 and accounting for 6.10% of the total variance. It was considered an outlier and could not be named.

The six-factor solution was robust since the amount of variability accounted for by the factors was 77.4%. Even though question 7d was under teaching competence construct, it was moved to ICT in education teaching. Also, ICT in education technology was grouped as individual question per construct as shown in Table 4.10. Question 7s was removed from the variance explained since it has factor loading less than 0.3.

4.3.2.2 Factor analysis on issues on type of training delivery method

The principal component analysis with varimax rotation resulted in a three-factor solution. The KMO measure resulted in a value of .6046 and the Bartlett test of Sphericity had a significant p-value of less than .001 and a chi-square value of 223.760. Therefore, the KMO (Kaiser-Meyer-Olkin) measure of sampling indicated that the correlations are adequate for factor analysis and there was there was sufficient correlation between variables. Only one item had

a communality below .6 of .568 and the rest of the communalities were above .6. The results of the factor solution are shown in Table 4.11.

Table 4.11: Factor solution on issues on type of training delivery method

Factors and observed variables	Loadings	Eigenvalues	% of variance
Factor 1: Outside school coursework		2.622	32.78%
Q8c. Coursework at college/university	.877		
Q9c. Coursework at college/university	.840		
Q9b. Out of District training	.762		
Q8b. Out of District training	.673		
Factor 2: District level in-service training		1.883	23.54%
Q8a. District level in-service training	.932		
Q9a. District level in-service training	.873		
Factor 3: In-school building level training		1.838	22.98%
Q9d. In-school building level training	.880		
Q8d. In-school building level training	.858		
Total variance explained			**79.29%**

The first factor was named "Outside school coursework" and the factor loadings ranged from 673 to .877. The eigenvalue was 2.622 and the factor accounted for 32.8% of the total variance. The factor consisted on issues on coursework at college/university and out of district training. Teachers were of the view that their professional development should happen outside of the school premises.

The second factor had an eigenvalue of 1.883 and accounting for 23.5% of the total variance. It was named "*District level in-service training*" because it was organised by Johannesburg District as on-the-job training.

The third factor was named "*in-school building level training*" and the factor loadings ranged from 858 to .880. The eigenvalue was 1.838 and the factor accounted for 23.0% of the total variance. The factor solution consisted of ICT training; and teaching and learning of special education students.

4.3.2.3 Factor analysis on issues on level of benefit of ICT device

The principal component analysis with a varimax method gave a factor solution, which resulted in a KMO of .717 with a Bartlett Test of Sphericity that gave a chi-square value of 122.187 with a p-value of less than .001. The solution was appropriate for factor analysis since KMO was above .5 and the Bartlett's Test of Sphericity was significant indicating sufficient correlations. The communalities were all above .5 with the majority being above .6. The factor solution resulted in a two-factor solution as shown in Table 4.12.

Table 4.12: Factor solution on issues on level of benefit of ICT device

Factors and observed variables	Loadings	Eigenvalues	% of variance
Factor 1: Large ICT devices		2.637	37.69%
Q10f. Computer (desktop)	.876		
Q10g. Laptop	.777		
Q10e. Educational software for learners with barriers	.733		
Q10d. Interactive/Smart whiteboard	.696		
Factor 2: Small ICT devices		1.896	27.09%
Q10a. Smart phone	.828		
Q10c. Tablet e.g. Ipad	.721		
Q10b. Internet	.680		
Total variance explained			**64.76%**

The first factor had an eigenvalue of 2.637 and it accounted for 37.7% of the total variance. The factor consisted of the devices computer (desktop), laptop, educational software for learners with barriers and interactive/Smart whiteboard. These devices are computer, laptop and smart whiteboard, and the factor was named large ICT device.

The second factor had an eigenvalue of 1.896 and it accounted for 27.1% of the total variance. The factors loadings ranged from .680 to .828. The factor consisted of the devices smartphone, tablet e.g. Ipad and Internet. The factor was named small ICT devices.

Overall, the two-factor solution was robust since the amount of variability accounted for by the factors was 64.8% and is above the threshold of 60 % as explained by Pallant (2016).

4.3.2.4 Factor analysis on issues on level of use of ICT device

There were seven items initially and two items "*laptop*" and "*smartphone*" were dropped from the analysis owing to cross loading. The KMO measure was .671 while the Bartlett test of Sphericity had a significant p-value of less than .001 with a chi-square value of 101.58. Therefore, there was sufficient correlation between variables and the KMO (Kaiser-Meyer-Olkin) measure of sampling indicated that the correlations are adequate for factor analysis. The majority of the communalities were above .6. The factor solution is shown in Table 4.13.

Table 4.13: Factor solution on issues on level of use of ICT device

Factors and observed variables	Loadings	Eigenvalues	% of variance
Factor 1: Large ICT devices		2.153	43.06%
Q11d. Internet	.890		
Q11a. Computer (desktop)	.817		
Q11e. Educational software	.778		
Factor 2: Small ICT devices		1.702	34.04%
Q11g. Tablet e.g. Ipad	.915		
Q11c. Ipad	.858		
Total variance explained			**77.10%**

The first factor was named "Large ICT devices" and the factor loadings ranged from .778 to .890. The eigenvalue was 2.153 and it accounted for 43.1% of the total variance. The factor consisted of the devices, Internet, computer (desktop) and educational software and these are the factors that have daily proportion ranging from 27.4% to 44.3%.

The second factor was named "Small ICT devices" and the factor loadings ranged from .858 to .915. The eigenvalue was 1.702 and it accounted for 34.0% of the total variance. The factor consisted of the devices, tablet and Ipad and these factors that have daily proportion ranging from 21.3% to 26.2%.

4.3.3 Independent t-tests to determine impact of teacher characteristics on ICT perceptions

The independent t-test was used to determine whether the means were different by gender at the 5% level of significance. The composite variables were found by averaging the Likert scale items. The tests were conducted at the 5% level of significance using the p-value approach. A p-value less than .05 led to the rejection of the null hypothesis indicating mean differences and if the p-value was less than .01 then the test was highly significant.

4.3.3.1 Independent t-test to determine difference in mean score by gender

The test for homogeneity of variances resulted in all aspects having p-values greater than .05 except the dimensions "*type of delivery method beneficial in receiving ICT training for teaching and learning of special education students*" and "*level of use of ICT devices*" with p-values of .032 and .003 respectively. This indicates that the variances for males and females were different and in this case, statistics under equal variance not assumed were presented. However, in terms of the test for equality of means, all p-values were more than .05 as shown in Table 4.14.

Table 4.14: Comparing differences in mean scores by gender

	Levene's test for equality of variances			**t-test for equality of means**			
	Equal variances …	**F**	**Sig.**	**T**	**Df**	**Sig.**	**Mean difference**
A	… assumed	.220	.640	.445	74	.657	.080
	… not assumed			.506	9.433	.624	
B	… assumed	.285	.595	.611	73	.543	.135
	… not assumed			.465	7.860	.654	
C	… assumed	2.672	.106	1.638	74	.106	.297
	… not assumed			2.269	11.225	.044	
D	… assumed	3.376	.070	1.745	72	.085	.253
	… not assumed			2.843	14.340	.013	
E	… assumed	.340	.562	1.476	74	.144	.193

Table 4.14: Comparing differences in mean scores by gender							
	Levene's test for equality of variances			**t-test for equality of means**			
	Equal variances …	**F**	**Sig.**	**T**	**Df**	**Sig.**	**Mean difference**
	… not assumed			1.507	8.828	.167	
F	… assumed	.179	.674	.552	70	.583	.096
	… not assumed			.589	9.195	.570	
G	… assumed	4.787	.032	1.914	64	.060	.374
	… not assumed			1.242	5.350	.266	
H	… assumed	2.125	.150	.473	65	.638	.075
	… not assumed			.295	6.418	.777	
I	… assumed	9.621	.003	.522	65	.603	.244
	… not assumed			1.115	23.198	.276	

A= Teacher competence; B= Teaching using ICT; C= Curriculum enhancement; D= ICT in education; E = General ICT perceptions; F= Type of delivery method beneficial in receiving ICT training; G= Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students; H = Level of benefit perceived of ICT device in teaching in inclusive environments; I= Level of use of ICT devices.

Looking at Table 4.14, gender did not have impact on teachers' perceptions of teacher competence, using ICT in education, teaching using ICT, professional development, and curriculum enhancement. There were equal mean scores on the dimensions by gender and therefore, the perceptions were the same for both males and females. As a result, gender is not a determinant in distinguishing teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement.

4.3.4 ANOVA tests to determine impact of teachers' demographic factors on ICT perceptions

The ANOVA tests were done to determine whether teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement were different for the schools, age groups, years of teaching experience, years in the current position, current role and professional qualification. As mentioned earlier, the composite variables were created by averaging the Likert scales. In the case were the test of homogeneity of variance was violated Welch robust test of equality of means was used to test for difference in means and the Games-Howell test was used as a post hoc test. In the case were the variances were equal, the traditional ANOVA F test was used and the Tukey B test was used as a test. The test was done at the 5% level of significance and the p-value approach was used to determine significance.

4.3.4.1 ANOVA test to determine differences in means by school

There were four schools that participated in the study. The schools were named A, B, C and D. The Levene's test of homogeneity of variance showed that all the variables had equal variances across groups except the variables *teacher competence, teacher using ICT, type of delivery method beneficial in receiving ICT training* and *level of benefit perceived of ICT device in teaching in inclusive environments* with p-values of .001, .047 , .020 and .015 respectively. In this case the Welch robust test of equality of means was used for testing equality of means for these variables. The ANOVA F test results are shown in Table 4.15.

Table 4.15: Test of homogeneity of means (ANOVA) by school

Constructs	Levene's test for equality of variance		Test for equality of means	
	F	***p-value***	***F***	***p-value***
Q7. Teacher competence	6.162	.001	4.758[b]	.007
Q7. Teaching using ICT	2.781	.047	2.217[b]	.105
Q7. Curriculum enhancement	1.334	.270	1.038	.381
Q7. ICT in education	.723	.542	1.438	.239

Q7. General ICT perceptions	.977	.409	1.065	.370
Q8. Type of delivery method beneficial in receiving ICT training	3.514	.020	1.428[b]	.254
Q9. Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students	2.228	.094	.663	.578
Q10. Level of benefit perceived of ICT device in teaching in inclusive environments	3.763	.015	.672[b]	.576
Q11. Level of use of ICT devices	.727	.540	.586	.627

[b] Welch F-statistic

In terms of equality of means, all dimensions had p-values of more than .05 indicating that the means were equal across the schools except the variable *teacher competence*. Therefore, there was no difference in teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement by school except in *teacher competence*. As a result, teacher characteristics were a determinant in distinguishing teacher perception in *teacher competence*.

The test of equality of means resulted in all dimensions having p-values of more than .05 except the dimension "*teacher competence*" with a p-value of .007, which was less than .05. This indicates that the means were different. The dimension resulted in a Welch F-value of 4.758 with a p-value of .007. This leads to the conclusion that there is difference in perceptions across schools for teacher competence. The effect size was .13, which is a medium effect and the Games-Howell post-hoc test showed that there were two homogeneous groups as shown in Table 4.16.

Table 4.16: Games-Howell post hoc tests of teacher competence by school			
Games-Howell			
School:	**N**	**Subset for alpha = 0.05**	
		1	**2**
D	14	3.0857	
A	28	3.2315	3.2315
B	17	3.2824	3.2824
C	17		3.4794

The major difference was between school D and school C. School D had the lowest mean of 3.09 while those from school C had the highest mean of 3.48. This is also supported by the non-overlapping between the confidence interval error bars shown in Figure 4.2.

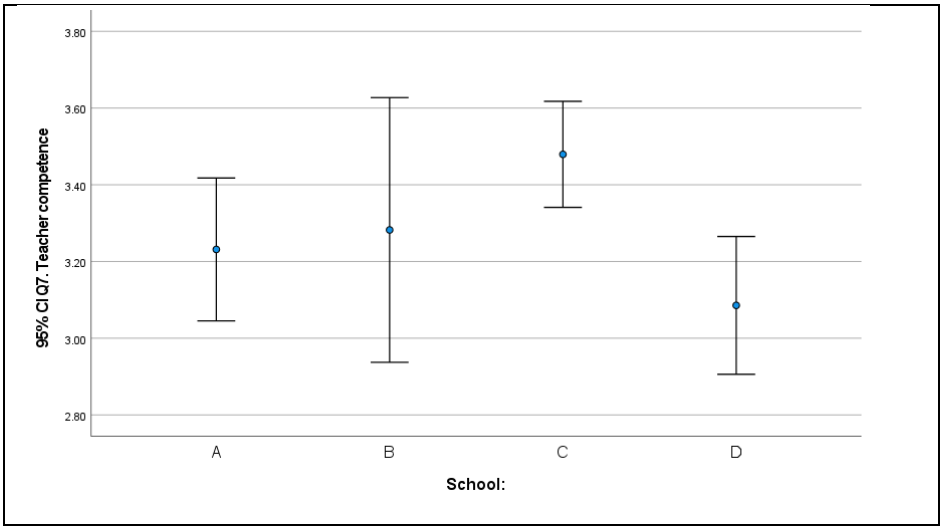


Figure 4.2 Confidence interval error bar for teacher competence by school

All means were close to three. However, those from school C were more in agreement on teacher competence than school D. This means all school were in agreement while those in school C agreed more on teacher competence issues.

4.3.4.2 ANOVA test to determine differences in means by age

The age group was divided into four groups which were 25 – 34 years, 35 – 44 years, 45 – 54 years, and 55 – 64 years. The test of equality of variance across groups had all p-values being more than .05 except on the variable *level of benefit perceived of ICT device in teaching in inclusive environments* with a p-value of .013. The Welch robust test of equality of means was

used to test mean differences. ANOVA results of the equality of means test are reported in Table 4.17.

Table 4.17: Test of homogeneity of means (ANOVA) by age

Constructs	Levene's test for equality of variance		Test for equality of means	
	F	*p-value*	*F*	*p-value*
Q7. Teacher competence	.054	.983	.943	.425
Q7. Teaching using ICT	1.289	.285	.580	.630
Q7. Curriculum enhancement	.638	.593	1.745	.166
Q7. ICT in education	.750	.526	.499	.684
Q7. General ICT perceptions	.567	.638	.596	.620
Q8. Type of delivery method beneficial in receiving ICT training	.905	.443	.039	.990
Q9. Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students	2.477	.070	.969	.413
Q10. Level of benefit perceived of ICT device in teaching in inclusive environments	3.867	.013	.279[b]	.840
Q11. Level of use of ICT devices	1.716	.173	1.003	.398

[b] Welch F-statistic

All dimensions had p-values of more than .05. This indicates that there was no difference in mean scores. Therefore, there was no difference in teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement by age. Therefore, age was not a distinguishing factor in teacher perception.

4.3.4.3 ANOVA test to determine differences in means by years of teaching experience

The years of teaching experience were divided into four groups which are 1 – 5 years, 6 – 10 years, 11 – 20 years and more than 21 years. The test on equality of variance was not violated in all dimensions as demonstrated by all p-values being more than .05. This indicates that there was equality of variances within groups. ANOVA results of the test of equality of means tests are reported in Table 4.18.

Table 4.18: Test of homogeneity of means (ANOVA) of years of teaching experience

Constructs	Levene's test for equality of variance		Test for equality of means	
	F	*p-value*	*F*	*p-value*
Q7. Teacher competence	.274	.844	.487	.692
Q7. Teaching using ICT	2.275	.087	.800	.498
Q7. Curriculum enhancement	.448	.720	.711	.549
Q7. ICT in education	1.395	.252	.092	.964
Q7. General ICT perceptions	1.555	.208	.454	.715
Q8. Type of delivery method beneficial in receiving ICT training	.730	.538	.099	.960
Q9. Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students	.571	.637	.764	.519
Q10. Level of benefit perceived of ICT device in teaching in inclusive environments	1.638	.190	1.266	.294
Q11. Level of use of ICT devices	1.478	.229	.068	.977

[b] Welch F-statistic

All dimensions had p-values of more than .05. This indicates that there was no difference in means, that is, there was homogeneity of means. It can be concluded that the mean scores do not differ due to years of teaching experience. Therefore, teacher perceptions were the same regardless of the years of teaching experience.

4.3.4.4 ANOVA test to determine differences in means by years in current position

The years in current position was divided into four groups which are 1 – 5 years, 6 – 10 years, 11 – 20 years, and more than 25 years. The test of homogeneity of variance was not violated in all dimensions as all p-values were more than .05. This indicates that there was equality of variances within groups. The results of the ANOVA tests are reported in Table 4.19

Table 4.19: Test of homogeneity of means (ANOVA) by years in current position

Constructs	Levene's test for equality of variance		Test for equality of means	
	F	*p-value*	*F*	*p-value*
Q7. Teacher competence	2.062	.113	.945	.424
Q7. Teaching using ICT	1.399	.251	1.512	.219
Q7. Curriculum enhancement	.314	.815	.316	.814
Q7. ICT in education	.365	.779	.443	.723
Q7. General ICT perceptions	1.570	.205	.926	.433
Q8. Type of delivery method beneficial in receiving ICT training	1.149	.336	.947	.423
Q9. Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students	.768	.517	1.024	.389
Q10. Level of benefit perceived of ICT device in teaching in inclusive environments	.601	.617	.428	.733
Q11. Level of use of ICT devices	1.639	.190	1.664	.185

[b] Welch F-statistic

All p-values were greater than .05. Therefore, the means were equal. However, the years in current position did not have any effect on teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement.

4.3.4.5 ANOVA test to determine differences in means by current role

The current role was classified into three groups which were educators, learner support educators and administrators. The test of equality of variance across groups had all p-values being more than .05 except on the variables *curriculum enhancement* and *level of benefit perceived of ICT device in teaching in inclusive environments* with p-values of .023 and .011 respectively. The Welch robust test of equality of means was used to test mean differences for the two variables. ANOVA results of the tests are reported in Table 4.20.

Table 4.20: Test of homogeneity of means (ANOVA) by years in current position

Constructs	Levene's test for equality of variance		Test for equality of means	
	F	*p-value*	*F*	*p-value*
Q7. Teacher competence	2.373	.100	2.245	.113
Q7. Teaching using ICT	.650	.525	1.438	.244
Q7. Curriculum enhancement	3.982	.023	.269[b]	.76 8
Q7. ICT in education	1.018	.366	.549	.580
Q7. General ICT perceptions	2.638	.078	1.209	.304
Q8. Type of delivery method beneficial in receiving ICT training	1.079	.346	.330	.720
Q9. Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students	3.061	.054	.469	.628
Q10. Level of benefit perceived of ICT device in teaching in inclusive environments	4.865	.011	4.679[b]	.019
Q11. Level of use of ICT devices	.390	.679	1.195	.309

[b] Welch F-statistic

The ANOVA tests resulted in all p-values being insignificant as evidenced by p-values of more than .05 except the variable level of benefit perceived of ICT device in teaching in inclusive environments. Therefore, current role did not impact in teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement by current role

except on level of benefit perceived of ICT device in teaching in inclusive environments. As a result, current role was a distinguishing factor in teacher perception on level of benefit perceived of ICT device in teaching in inclusive environments.

The test of equality of means resulted in all dimensions having p-values of more than .05 except the dimension "*level of benefit perceived of ICT device in teaching in inclusive environments*" with a p-value of .019, which was less than .05. This indicates that the means were different. The dimension resulted in a Welch F-value of 4.679 with a p-value of .019. This leads to the conclusion that there is difference in perceptions across current role. The effect size was .10, which is a moderate effect and the Games-Howell post-hoc test showed that there were two homogeneous groups as shown in Table 4.21.

Table 4.21: Games-Howell post hoc tests of level of benefit perceived of ICT device in teaching in exclusive environments by current role

Games-Howell

School:	N	Subset for alpha = 0.05	
		1	2
Educator	48	2.6438	
Learner support educator	8	2.7500	2.7500
Administrator	11		2.8874

The major difference was between the educators and administrators. The educators had the lowest mean of 2.64 while the administrators had the highest mean of 2.89. This is also supported by the non-overlapping between the confidence interval error bars shown in Figure 4.3.

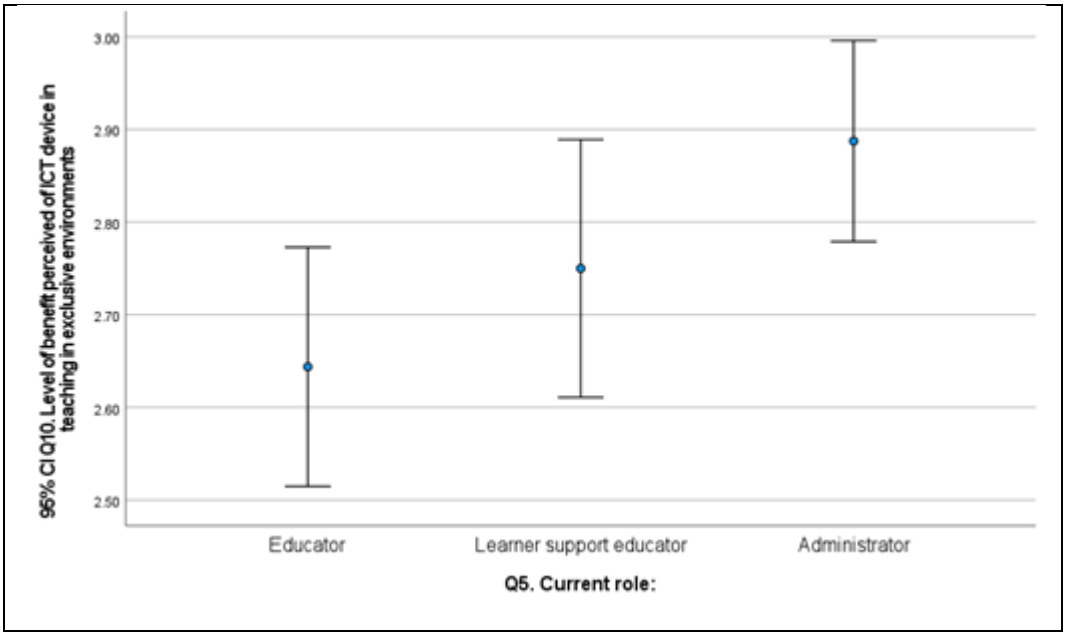


Figure 4.3 Confidence interval error bar for level of benefit perceived of ICT device in teaching in exclusive environments by current role

All means were close to three. However, the administrators were more in agreement than the educators. Therefore, the administrators were more in agreement on issues on level of benefit perceived of ICT device in teaching in exclusive environments.

4.3.4.6 ANOVA test to determine differences in means by professional qualification

The professional qualification was categorised into three groups, namely, 3 year diploma + teacher experience, Bachelor's degree and Bachelor's degree + teacher experience. The test of homogeneity of variance had all p-values of more than .05, indicating that the variances were equal. ANOVA results of the tests are shown in Table 4.22.

Table 4.22: Test of homogeneity of means (ANOVA) by professional qualification

Constructs	Levene's test for equality of variance		Test for equality of means	
	F	*p-value*	*F*	*p-value*
Q7. Teacher competence	2.594	.082	3.223	.046
Q7. Teaching using ICT	.662	.519	1.079	.346
Q7. Curriculum enhancement	.160	.852	.921	.403

Q7. ICT in education	1.407	.252	1.084	.344
Q7. General ICT perceptions	.842	.435	2.461	.093
Q8. Type of delivery method beneficial in receiving ICT training	2.520	.088	.491	.614
Q9. Type of delivery method beneficial in receiving ICT training for teaching and learning of special education students	2.752	.072	.604	.550
Q10. Level of benefit perceived of ICT device in teaching in inclusive environments	1.730	.186	.959	.389
Q11. Level of use of ICT devices	2.425	.097	1.846	.166

[b] Welch F-statistic

The test of equality of means resulted in all dimensions having p-values of more than .05 except the dimension "*teacher competence*" with a p-value of .046, which was less than .05. This indicates that the means were different. The dimension resulted in an F-value of 3.223 with a p-value of .046. This leads to the conclusion that there is difference in perceptions across professional qualifications. The effect size was .08, which is a moderate effect and the Tukey B post-hoc test showed that there were two homogeneous groups as shown in Table 4.23.

Table 4.23: Tukey B post hoc tests of teacher competence

Tukey B[a,b]

Q6. Professional qualification:	**N**	**Subset for alpha = 0.05**	
		1	**2**
3 year diploma + teacher experience	40	3.1558	
Bachelor's degree + teacher experience	27	3.3333	3.3333
Bachelor's degree	6		3.6333

The major difference was between those with 3 year diploma + teacher experience and Bachelor's degree. Those with 3 year diploma + teacher experience had the lowest mean of 3.16 while those with Bachelor's degree had the highest mean of 3.63. This is also supported by the non-overlapping between the confidence interval error bars shown in Figure 4.4.

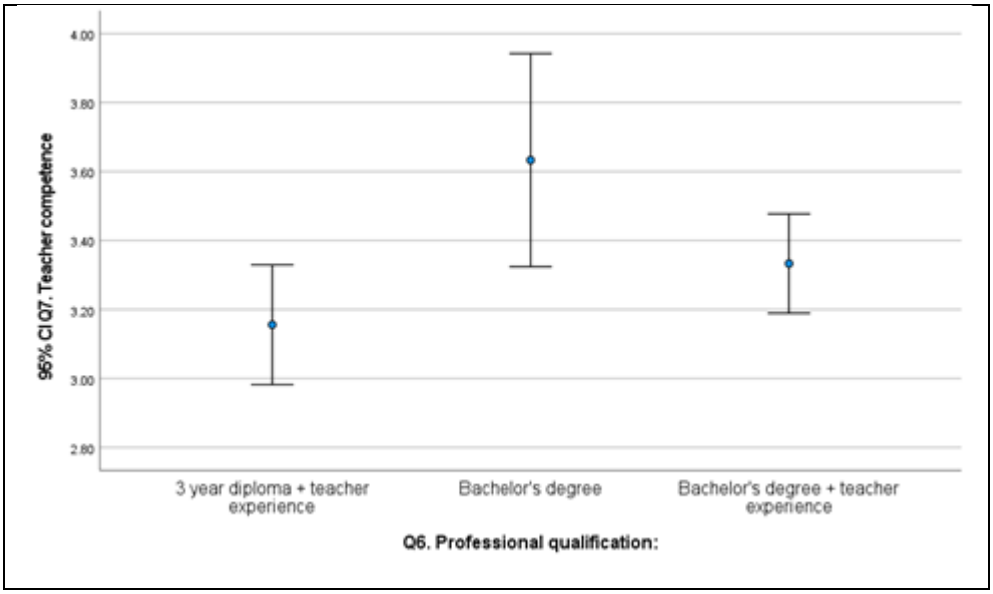


Figure 4.4 Confidence interval error bar for teacher competence by professional qualification

Those with 3 year diploma + teacher experience had means close to three. This indicates that there were in agreement while those with Bachelor's degree had means close to four indicating that they were agreeing strongly. Therefore, those with degrees agreed strongly on teacher competence issues.

4.4 Summary of the findings

This chapter analysed the data from the questionnaires and school policies that was collected for this study. The semi-structured interview data focused on responses from the principals with regards to the availability of ICT resources in the school and included analysis of the school ICT policies. The quantitative data honed in on soft issues of teacher perceptions on ICT-related matters.

The research found that the four Inclusive Schools in Johannesburg Central District had scanty availability of ICT resources. ICT infrastructure was accessible but not usable owing to it being offline or being kept in the school storeroom because of security reasons. Crime is a major factor that contributes to lack of interest in using ICT for teaching and learning (literature). ICT-enhanced teaching and learning requires accessible and usable ICT infrastructure. Schools are relying heavily on district provided ICT resources; both infrastructure and maintenance. Robust ICT-enhanced teaching and learning thrives on quick turn-around times from non-operational to operational environments so that teaching and learning may not be hampered.

This goal necessitates that schools be able to easily "bounce back" from temporary non-operational circumstances by having readily available ICT support and maintenance. Waiting for the district to provide ICT support and maintenance may hinder ICT-enhanced teaching and learning in inclusive schools. Yet, on the other hand, schools may not have muscle to provide its own private ICT support and maintenance. Private ICT support and maintenance can be very expensive, but it may contribute to higher turn-around times to get the school to an operational state. Two schools have an ICT co-ordinator - which is recommended by the provincial legislation for ICT in the schools. Inclusive schools requiring sophisticated ICT to support a myriad of learners' needs- easily accessible support and maintenance means that ICT-enhanced teaching and learning will not be hampered.

Teacher ICT perceptions with regards competence, using ICT in education, teaching using ICT, professional development and curriculum enhancement were positive. Exploratory analysis was conducted to determine whether teacher demographic factor had influence on their ICT perceptions.

Teacher ICT perceptions with regards competence, using ICT in education, teaching using ICT, professional development and curriculum enhancement were positive. Exploratory analysis was conducted to determine whether teacher demographic factor had influence on their ICT perceptions.

The following was discovered:

- **Gender** has no significant difference with regards to teacher ICT perceptions.
- **Professional qualification** - there was a significant difference with regards to teacher competence using **professional / qualification** as the demographic factor or characteristic. The major difference was between those with 3 year diploma + teacher experience and Bachelor's degree. Those with 3 year diploma + teacher experience had the lowest mean of 3.16 while those with Bachelor's degree had the highest mean of 3.63. Teachers with bachelor's degrees (M+4) agreed strongly on teacher competence issues than teachers with (M+3) diplomas with teacher experience.
- **Age** has no significant difference with regards to teacher ICT perceptions.
- **Number of years in current position** has no significant difference with regards to teacher ICT perceptions except for level of benefit perceived of ICT device in teaching

in inclusive environments. There was a significant difference with regards to level of benefit perceived of ICT device in teaching in inclusive environments by current role as the demographic factor or characteristic. The major difference was between the educators and administrators. The educators had the lowest mean of 2.64 while the administrators had the highest mean of 2.89. Thus, administrators were more in agreement on issues on level of benefit perceived of ICT device in teaching in inclusive environments than educators.

- **The school environment** influences how teachers perceive their ICT competence.
- **Current role has an influence on the teachers' perceptions on the issue of the** level of benefit perceived of ICT device in teaching in inclusive environments. Different role players in the school have varied perceptions on the role of ICT devices in Inclusive Schools. To have a harmonious school environment the school needs to bring all on board in the understanding of how ICTs are used, should be used or could be used in the teaching environment of the school.
- **Teacher experience** has no significant difference with regards to teacher ICT perceptions.
- **Amongst the schools**, there is no significant difference with regards to teacher perceptions as shown in Table 4.15 except for teacher competence. There was a significant difference with regards to teacher competence by school as the demographic factor or characteristic. The major difference was between school C and school D. School D had the lowest mean of 3.09 while those from school C had the highest mean of 3.48. Thus, school C was more in agreement than school D

Chapter 5 will discuss the findings by answering each sub-research question. The culmination of which will answer the main research question.

CHAPTER 5:

DISCUSSION OF FINDINGS

5.0 Introduction

The previous chapter presented the analysis of the data collected for this research. The current chapter delves into discussion of the findings as a response to the research question and sub-questions. The purpose of the study, research objectives and the research questions were outlined in Chapter 1. Thereafter, the discussion of the findings will be guided through the utilisation of the combined research conceptual framework (see Section 3.3.2.3 Table 3.1) and reviewed literature (Creswell, 2014).

The Becta's Self-Review Framework as expanded on in Section 3.3.2.1 of Chapter 3, consists of six elements (previously eight elements) that assist schools to examine their level of ICT implementation and use and together provide a comprehensive picture of a school's ICT developments. The framework can be used for all types of schools. Each element is divided into strands, which break down further into different aspects. For this study, four elements were perceived by the researcher to be relevant to the study to assist in embodying the dimensions under exploration:

- Learning and teaching;
- Professional Development;
- Extending opportunities for learning; and
- Resources.

SAIDE was commissioned to investigate the readiness of Gauteng schools to use ICT in teaching and learning in 2010. The organisation (SAIDE) developed the E-Readiness Index. This index assists the schools to look at the status to identify strengths and weaknesses in ICT integration in their schools, the level of achievement or attainment of ICT integration goals and as the basis from which to create their own policies and plan for the future (GDE 2011 p 13).

The dimensions of the index are mentioned in Section 3.2.2.2 in Chapter 3 as:

- School has an ICT co-ordinator.
- School has an ICT policy / plan.
- Teacher confidence.

- Learner access to computers outside class.
- School has some form of ICT support.

The world is a technology-driven society. Technology is used everywhere including education where it has been used to offer opportunities to the previously marginalised learners. It is critical to gauge how society is ready for technology because at most, it brings a paradigm shift i.e. from an "old way" of doing things to a more "robust, dynamic" way. There is a multiple-item scale, Technology Readiness Index (TRI), which is used to gain understanding of the readiness of people to embrace new technologies. This index, developed in 2000, observes positive drivers of optimism and innovativeness, and negative inhibitors of discomfort and insecurity (Parasuraman, 2000). This suggests that technology may be experienced by people in different ways - draw people near or push them away.

5.1 Purpose of the study

The purpose of this study was to investigate ICT-related factors that contribute to the provision of ICT-enhanced teaching and learning in schools. Investigating these factors contributes to the "identification and resolving of barriers". ICT-enhanced teaching and learning is also referred to as e-Education. These factors are School ICT policy, School ICT Infrastructure, ICT Community Support, Teacher ICT perceptions, and Teacher ICT professional development in ICT.

5.2 The state of ICT-enhanced teaching and learning in Inclusive Schools

The discussion of the findings was conducted by aligning the study objectives, research questions and the findings.

5.2.1 School ICT Infrastructure

Objective: *To establish the currently available Information and Communication Technologies for ICT-enhanced teaching and learning and the supportive maintenance structures that exist.*
Question: *How adequate is the current ICT infrastructure for providing ICT-enhanced teaching and learning?*

In their research, Arukaroon and Krairit (2017) focused on themes of infrastructure, use and innovation. They created four levels that were used to classify schools' technology outlook:

- Level 1 schools had limited use of ICT in educational tasks; connectivity is constrained to only once computer without a network and lack of motivation or interest from teachers.
- Level 2 schools have well-equipped classrooms; ICT use is dependent on teachers' preference and not mandated- not part of ICT policy.
- Level 3 schools have several well-equipped and networked computers; students and teachers have access to computers in the classroom or learning areas; ICT use is partially included into the school development plan.
- Level 4 schools have determined that ICT is a distinct and driving element of schools' educational activities; has good equipment that is fully connected to the internet; there is a trusted personnel assigned to maintenance of the ICT; and the school development plan is an endorsement from the school leadership

In this ICT Infrastructure enquiry, the research themes used to shape the discussion were availability, support and maintenance. By borrowing from the school level categories used in Arukaroon and Krairit (2017), the following were found:

5.2.1.1 Availability

According to Panyaza Lesufi, who is the MEC for the GDE, "ICT allows access to a wide range of information in various formats, and interactive whiteboards have become essential tools in the classroom" (Gauteng Department of Education, 2016). However, this is not the case in these schools. ICT infrastructure is scarcely available and at times not accessible. The principal of the school where 40 tablets were locked in the storeroom and not used for teaching and learning informed the researcher that due to security threats and previous burglaries and theft of previous computers, these are now locked-up and not in use. As a result of the theft of computers, the computer room had been converted into an ordinary classroom. Having ICT with compromised internet access is also not a positive contribution towards ICT-enhanced teaching and learning (Ibieta et al., 2017).

This reflects that these schools are very scantily ICT resourced. With a primary school learner figure of 89 115 (DBE 2015) within the Johannesburg Central District, shortage of ICT for teaching and learning is a cause for concern. These Inclusive Schools are government or State schools and this scarcity of resources may be experienced differently by independent or private

schools who may have more liberty to innovatively respond to challenges in Inclusive Education (Walton et al., 2009).

Becta's Self-Review Framework commits a school to focus on, amongst other things, resources (Section 3.3.2.1 of Chapter 3) in their strategic roadmap to implementing ICT-enhanced teaching and learning. Among these resources is ICT infrastructure. ICT infrastructure is a basic condition for ICT-enhanced teaching and learning even though pedagogy and social interaction are also critical components of a teaching and learning environment enhanced by technology (Wang, 2008). The usage of ICT in teaching and learning does not necessarily equate to better student attainment (Arukaroon & Krairit, 2017) but is a vital ingredient. Using the scale of *Most beneficial, Less beneficial and Least beneficial*, the principals were asked to rate some of the ICT. All four schools were unanimous in their perception that having a smart phone, Internet, tablets, educational software for learners with barriers, and laptops were *Most beneficial* in their inclusive environments. Interactive whiteboards, desktop computers and laptops were also perceived as *Most beneficial* by three schools. Inclusive Schools are of the view that having Internet, tablets, smart phones, interactive whiteboards, desktop computers, laptops, and educational software for learners with barriers would benefit these inclusive teaching and learning environments. In ICT-enhanced teaching and learning, ICT resources must be available and accessible. Governments and educational authorities have played a vital role to ascertain the availability of ICT resources in schools; albeit in the form of desktop computers (GDE, 2011). These resources were implemented using the 'computer-lab model' owing to reasons mentioned in Section 2.6. Even though contextual realities in developing countries may necessitate the upkeep of this model, current technologies, like mobile platforms require rethinking of the technology-school space for creating a flexible implementation. This is especially critical in Inclusive Schools where there is a need for specialised technologies for learners with Special Needs.

The Internet as a teaching and learning tool can be categorised into three aspects- for training activities, to facilitate personal contact and lastly to extend the scope for access to services and content (Sangra & Gonzalez-Sanmamed, 2010). These Inclusive Schools do not have access to Wi-Fi. They are under-resourced with Internet as it was provided by a service provider appointed by the Educational Authority's ICT project (GautengOnline Project), which had eventually collapsed. Other ICTs that are used are in ICT-enhanced teaching and learning are

Interactive White Boards (IWB), laptops, smart phones, which are not adequately available in these Inclusive Schools.

This is not adequate to provide ICT-enhanced teaching and learning in Inclusive Schools where there is a great diversity of learners with varying learning needs. The ICT resources are very scanty in these Inclusive Schools. This means that ICT-enhanced teaching and learning is not thriving in these Inclusive Schools. It is of concern that schools can be provided with ICT for educational purposes but due to operational challenges they are not accessible or usable. Availability of ICT resources is a critical component to ICT-enhanced teaching and learning but more critical is their accessibility and usability. None of the Inclusive Schools have Interactive White Boards (IWB). Constrained learning spaces can be augmented by dynamic ICT solutions that can provide flexible pedagogy.

5.2.1.2 Support

The national ICT policy indicates that a school must have an ICT co-ordinator (White Paper: e-Education, 2004). The E-Readiness Index informs that schools must have "some form of ICT support." Three Inclusive Schools have an ICT co-ordinator. This condition is very important because the role of the ICT co-ordinator is amongst others, to guide the school on how to use ICT in teaching and learning. ICT co-ordinators that support ICT-enhanced teaching and learning need to be expert in their field (McGarr & McDonagh 2013) because they are not just educators but also provide expert skills in a highly technology-infused environment. This is supported by McGarr and McDonagh (2013) who found that despite the level of technical competence they possess, ICT co-ordinators still express a need for further professional development focused on technical knowledge and skills.

5.2.1.3 Maintenance

The "on-demand" availability of technically skilled personnel to maintain specialised ICT that is used in inclusive environments is critical but there needs to be a cost effective and sustainable maintenance model to support this; for example, having education authorities provide contract service providers but also allowing schools the liberty to source their own services "on-demand" where feasible.

ICT-enhanced teaching and learning benefits extremely on the availability of skills for ICT maintenance whether in-house or within the vicinity of the schools, as it allows for quicker turn-around times for ICT resources to be "up and running." This hierarchy of ICT maintenance where education district authority arranges and is solely responsible for ICT resources may be cost-effective from the government's perspective. However, for a school that is pursuing ICT-enhanced teaching and learning, it could pose some bureaucratic challenges. Inclusive learning environments cannot afford to have lag times in waiting for ICT maintenance as this could impact on teaching and learning. Perhaps this is the case why some of the schools employ "Other ways" of ICT maintenance because waiting for assistance arranged by the education district authority may be delayed. ICT-enhanced teaching and learning is compromised - especially under such constrained educational environments of trying to complete the syllabus within designated timeframes. Standardization of maintenance processes, though, is critical to make sure that ICT investment is kept at optimal standards. Some of these ICTs are much specialised software and hardware for learners with barriers. A model that could be used is to pursue standardization of maintenance by the education authority but also have room for schools to source their own ad hoc maintenance from private entities known to them - provided there are policy guidelines for school ICT- from procurement to disposal. Some schools have benefitted from support from private donors on Corporate Social Investment (CSI) to function, as is the case with School D, which relied heavily on influential personalities in the private sector. Donations from private individuals and companies can be leveraged for the benefit of continuous ICT-enhanced teaching and learning.

The study has exposed that where schools depend on ICT maintenance procured by the education authority, there could be delay in accessibility and usage of ICT for teaching and learning. Other schools became self-reliant by finding innovative ways to provide own ICT maintenance. Therefore, schools do not need to solely rely on the educational authority contracted maintenance providers as this may cause educational down-time in ICT-enhanced teaching and learning. Schools should be encouraged to find ways to provide their own reliable ad hoc structures to ICT maintenance. The challenge is that the education authority or private donors in a structured manner- fund most ICT resources where total reliance is on these funding bodies. Private ICT maintenance may be costly for government schools; hence, "Other" ways may be used for example someone known to the school within the vicinity of the school providing ad hoc maintenance. Although, if not monitored, which may compromise the integrity of the ICT infrastructure. The "on-demand" availability of technically skilled

personnel to maintain specialised ICT that is used in inclusive environments is critical but there needs to be a cost effective and sustainable maintenance model to support this for example having education authorities provide contract service providers but also allowing schools the liberty to source their own services "on-demand" where feasible.

From the research, it was found that only one school could be classified as a Level 3 school; while the other three schools could be classified as a Level 1 school owing to various factors.

Through the lens of the E-Readiness Index, these Inclusive Schools are not ready for e-Education. Therefore, ICT-enhanced teaching and learning is not in practice. Even though the biggest factor that there is very positive teacher confidence and willingness in using ICT for teaching and learning in Inclusive Schools, the results of this research agree with what (Walton, et al., 2009) found that South Africa needs to address the issue of ICT resource constraints.

Inclusive Schools have a dire need for ICT resources so that ICT-enhanced teaching and learning can become a reality. There are no interactive whiteboards, available iPads are not in use, and available computers are not connected to the Internet. ICT support is minimal and done haphazardly. Maintenance structures for school ICT need to be revisited as total dependence on the government for school ICT maintenance is problematic. Information and Communication Technologies and supporting structures are not adequate to steer Inclusive Schools in Johannesburg Central District towards ICT-enhanced teaching and learning.

5.2.2 ICT Community Support

Objective: *To define the extent of community access to current school ICT infrastructure for support and use after hours*

Question: *In these schools, how is the current school ICT infrastructure being utilised, after hours, for community support for information access and training of special needs learners?*

According to e-Education goals (White Paper: e-Education 2004), school ICT resources should be made available for community use. Community support in this instance refers to the accessibility of ICT resources for extra-curricular activities of teaching, learning and information access. This was alluded to earlier in Section 2.6.1 as the potential for dual use of school facilities for students during the day and by the community when school is not in session. Parents of Learners with Special Needs, for example with Autism, can be given access

to school ICT resources to learn with their children after hours, to gather other information pertinent to their challenges and also garner support from others who are experiencing the same circumstances. These Inclusive Schools do not provide ICT Community Support owing to two important factors of safety, security and theft; and a rigid non-allowance of contractor installed ICT to be used for purposes other than those strictly related to school-time activities. Safety and security of resources is very critical, especially owing to previous encounters of with break-ins and theft of ICT resources experienced by these Inclusive Schools. Replacement of ICT is very costly. Theft of ICT may result in indignation and loss of interest in using ICT. Inclusive Schools must address these issues to ascertain that ICT-enhanced teaching and learning is not thwarted. Adapting ICT policies that govern the use of school ICT, who-where-what-when, is critical. Currently, ICT Community Support seems to be an unachievable dream. Learners with disabilities and their parents would not be able to access school ICT currently owing to the above-mentioned conditions. Even though principals were positive about ICT Community Support being available after hours as, "There should be string (sic) monitoring and accountability" and "It's a good way of strengthening partnerships with stakeholders, and more time will be made available to support such learners". Nevertheless, the current threats of "safety and security" do not contribute positively to this view. According to the e-Education White Paper (2004), access to ICT resources after hours is also a key element for schools that are implementing ICT-enhanced teaching and learning to promote community support. It seems opening to the general community i.e. learners and their parents or guardians who are not day-scholars at these Inclusive Schools may pose a threat to safety and security of resources. However, one principal was of the view that "prior notification and arrangements through the school's leadership structures" could be a means used to control offering of this opportunity to the public.

Principals indicated that ICT Community Support "cannot happen at all, during Mon-Friday after school hours, alternate days of the week after school hours" but rather "during school holidays and Saturdays". This means that ICT-enhanced teaching and learning cannot be extended as ICT Community Support for learners with barriers or Special Needs during normal academic time-frames (Monday to Friday) but rather on Saturdays and school holidays. This is still a positive step in the direction of accommodating learners with Special Needs and the community who can access school ICT resources on Saturdays and School holidays for learning.

One principal emphasised that “The partnerships between the school and the community should be natured to grow in strength so that the school may benefit from their support.” Contrasting to this positive stance, two principals indicated that ICT Community Support cannot happen at all. Principals had indicated that “security and safety of the resources” is a concern as well as resources being “off-line.” One principal summed this ideal to provide ICT Community Support after hours because “Schools should act a "Community builder". Hence, the community should be able to get access even after hours.” Although Saturdays and school holidays are the ideal times, this may still not be viable largely owing to security reasons and resources being off-line. Education authorities need to support schools with measures on how to make school ICT accessible to the community without compromising school security. Even though this may be beneficial to communities with learners with barriers or Special Needs, the needs to be a balanced operational model that would consider all these matters. ICT Community Support is not included in the school ICT policy and this must be made explicit in the school ICT policy.

The Self-review Framework encourages schools to “Extending opportunities for learning [sic]” through ICT and the e-Readiness Index requires schools to give communities access to school technology “outside of normal school hours”. This is not currently the case in these Inclusive Schools owing to experiences of theft and security. Trucano (2011) concurs that security is very critical in developing countries. Extending learning opportunities, outside of normal learning structures, are discouraged by theft and compromise of ICT resources. Inclusive Schools within Johannesburg Central District are not ready to extend ICT community support for learners outside of normal school learning hours.

5.2.3 School ICT Policy

Objective: To determine the availability and adequacy of inclusive school’s ICT policies.

Question: What is the status of school ICT policies that support ICT-enhanced teaching and learning?

The lingering theme from both the principals’ views and the analysis of the policy documents is the drastic need to review the school ICT policy in Inclusive Schools. It is imperative for inclusive school’s ICT policies to reflect the commitment to provide and foster ICT-enhanced teaching and learning that will benefit all types of learners. The E-Readiness Index prescribes

that schools must have an ICT policy or plan. Policy must drive school strategy. ICT policy is one of the essential factors that contribute to an integrated, albeit complex, school ICT plan (Sangra & Gonzalez-Sanmamed, 2010). Policy must guide the what, why and "how to" of any ICT-enhanced education.

Two principals have indicated that their schools have an existing ICT policy. School B principal indicated that there is no ICT policy available owing to "*the fact that our computer classes have been off-line for quite some time*" [sic] and the other school indicating *Partial* existence because "*The policy needs to be reviewed in order to suit the needs of the school properly*" [sic]. ICT policy must drive ICT use in the school and not the other way around. With a view that there is a need to review the school's ICT policy to accommodate the current needs of the Inclusive Schools means that school leadership wants to implement the standards set out by the DoE (White Paper, 2004).

Two of the schools have indicated that their ICT policy does specify the use of ICT for teaching purposes while the other two indicated the contrary. This is crucial as it dictates the level of accountability and commitment to ICT-enhanced teaching and learning. ICT policy must clearly specify the what, how and where of ICT in teaching and learning.

One school indicated that it has an "inclusive ICT Policy". According to the principal, "*the policy provides for all learners*." Another principal said that their ICT policy *Partially* caters for teaching learners with barriers or Special Needs. Principals had different views on the inclusivity of their ICT policy whether it caters for learners with Special Needs. They commented that their "ICT Policy-Based on GOL [Gauteng Online] and Leaners with Special learners needs not included." Gauteng Online (GOL) was the education authority ICT initiative to provide computers in schools. According to one of the principals the GOL was not geared to providing ICT for all types of learners. Another one explained that they "*do not have software that accommodates learners with Special Needs*." This means that an ICT policy exits but may not cater for learners with Special Needs. At another school, the principal emphasised that their ICT policy "*needs to be reviewed*" indicating that there is an identified need to change their ICT policy to be inclusive by catering for the teaching of learners with Special Needs. One school said that their ICT policy *Partially* specifies the use of ICT for teaching learners with Special Needs and learning barriers- "*provides for all learners*."

When asked whether the ICT policy caters for the learning of all type of learners (inclusivity), one principal explained that "*only mainstream learners*" are catered for in their policy and another informed that their school ICT policy *Partially* caters for all types of leaners but emphasised that it "*need to be reviewed and refined*". The recurrent theme of ICT policy needing to be reviewed was prevalent.

One principal responded that their policy does not specify the use of school ICT infrastructure for community support and commented that the "*Community is not considered*." Another principal responded that "*No person or individual that can assist in this area*." The third principal responded that "*It doesn't include community support because we have tablets not the workstations; the classroom that was used as a lab is now the normal classroom due to lack of space*." Only one principal responded that their school ICT policy does cater for community support and commented "*It is one of the best way [sic] of building up relations between stakeholders*." The principals indicated that the community was not considered for using school ICT infrastructure owing to space issues that inhibit the community from accessing these ICT resources. One principal seemed to be looking into the future by looking at building relations with community members.

Two principals responded that their ICT policy does *Partially* specify the use of school ICT for teacher ICT professional development but that "*teachers are incorporated in ICT*". However, they also observed that the policy "needs to be reviewed" to support teachers' professional development. School ICT policy must drive any strategic ICT implementation. Schools must "own" their policy and implement it. This means that, as most ICT implementation strategies are top-down from education authorities to the schools, policies are usually also top-down. This means that the school may not have ownership of the policies they are implementing. The other school indicated that their ICT does not specify use of school ICT for teacher's professional development. One school has an ICT that caters for teachers' professional development although the principal's comment was that "*teachers need to be incorporated in ICT*." In the other three schools, the ICT policy does not speak to the educators' professional development needs to promote ICT-enhanced teaching and learning. One principal again emphasised the previous sentiment of the need to review and refine their ICT policy.

Principals were asked to comment on their school ICT policy from its existence, inclusivity for all learners, inclusivity for teacher ICT professional development to inclusivity that caters for the community.

There is an inadequacy of School ICT policy that drives ICT-enhanced teaching and learning. Where ICT policy exists, it is highly in "need of review" to cater for teaching and learning all types of learners. School ICT policy that drives ICT-enhanced teaching and learning must also cater for teachers' professional development needs. ICT community support as stipulated in the DoE's White Paper e-Education should be clearly incorporated into School ICT policy to enforce compliance.

Principals had informed that they do have ICT policies. This was confirmed by three ICT policies received from four schools. On further perusal of the ICT policies, it was discovered that they were speaking to different audiences and for different purposes. A school can have one ICT policy that encompasses all the necessary detail of how ICT is used in the school or a school can have various ICT-related policies that speak to different aspects e.g. ICT in the Classroom, ICT procurement, ICT security, ICT and staff development etc. With the three policies obtained, only one encompassed the whole role of ICT in the school and it was individualised to the needs of the school because it was developed by the school. The other two were development and provided by the ICT service provider and the Department - the school had no input. For ICT to drive ICT-enhanced teaching and learning, the school itself must drive its own policy development and implementation.

From analysis of the policies (see Appendix F), the use of ICT for teaching learners with Special Needs is not specified. The policies were inadequate because they were provided by the service provider and the education authority for specific subject use e.g. Maths Literacy.

There is a basic understanding and use of ICT in these Inclusive Schools. The ICT policy is not leading the strategic ICT-enhanced teaching and learning. The school ICT policies analysed do not speak to their inclusive nature. Utilisation of school resources for teaching and learning outside normal school hours is not included in the school's ICT policy. Principals had differing views about allowing access to school ICT infrastructure for use by the community. Their policies reflect this view because it does not specify the use of school ICT infrastructure for community use. One school had a positive outlook on providing the community with access to

school ICT but their policy document did not reflect this view. Schools must implement what their ICT policy says- there must be coherence.

ICT policies are very vague on the use of school ICT infrastructure for teacher professional development. One policy mentioned the use of computers with e-mail communication for teachers, but this is not adequate. School ICT infrastructure should be used in various scenarios - not just for communication. Training for ICT-enhanced teaching and learning can also be facilitated using the same school ICT infrastructure. Policy must enshrine the teachers' right to appropriate ICT training. Inclusive Schools need robust ICT support and infrastructure to which their educators must be highly equipped to use. Professional development must be at an intermediate level i.e. above basic computer literacy. Educators and teachers need to develop their ICT skills, which will enhance and allow them to be able to teach learners with diverse needs who may need to use specialised ICT equipment.

5.2.4 Teacher ICT Perceptions

Objective: To learn of teachers' ICT perceptions of using ICT in education, teaching, professional development and curriculum enhancement.

Question: What are the perceptions of the teachers using ICT in education, teaching, professional development and curriculum enhancement?

Teachers' perceptions of the role of ICT and how it can be of benefit to the teaching and learning influences their actual use of the technology (Sangra & Gonzalez-Sanmamed, 2010). Meta-analysis of research on the utilisation of ICT in teaching and learning has been carried out over the years. Major categories in these researches are "attitudes, opinions, perception, and assessment of teachers' assumptions" of ICT use in education; the role of the Internet as a teaching and learning tool (Sangra & Gonzalez-Sanmamed, 2010). Positive attitudes towards technology and previous practice in using computers are factors that have an effect on teacher's use of ICT (Sangra & Gonzalez-Sanmamed, 2010).

As mentioned earlier, there were four schools. About 35.9% (n=28) were from school A, 21.8% (n=17) from school B, 24.4% (n=19) from school C and 17.9% (n=14) from school D. In terms of equality of means, all dimensions had p-values of more than .05 indicating that the means were equal across the schools except on teacher competence. There was no difference in teachers' perceptions of ICT in education, teaching using ICT, and curriculum enhancement

by school. However, teacher competence was a factor determinant in distinguishing teachers' ICT perceptions.

The majority of the respondents were above 44 years and close to 70% of the respondents were aged between 35 – 54 years. This is in line with national figures where the majority of the workforce were middle aged (Statistics South Africa: Quarterly Labour Force Survey, Quarter 3: 2020). The findings were that there was no difference in teachers' ICT perceptions of ICT in education, teacher competence, teaching using ICT, and curriculum enhancement by age. Therefore, age was not a distinguishing factor in teacher perceptions.

The ratio of females to males is 9 is to 1. Therefore, close to 90% (n=70) are females while 10.3% (n=8) were males. The gender composition is not representative of the South African Workforce where 56.4% were males while 43.6% are females (Statistics South Africa: Quarterly Labour Force Survey, Quarter 3: 2020) but is representative of the teaching workforce, which is referred to the "feminisation" of teaching. However, gender did not have impact on teachers' ICT perceptions of ICT in education, teacher competence, teaching using ICT, and curriculum enhancement. There were equal mean scores on the dimensions by gender and therefore, the ICT perceptions were the same for both males and females. As a result, gender is not a determinant in distinguishing teachers' ICT perceptions.

It was concluded from the findings that the teachers were very experienced and that their ICT perceptions were the same regardless of the years of teaching experience. Close to half, that is, 47.3% (n=35) had at most 5 years in their current position, 14.9% (n=11) had 6 -10 years, 27% (n=20) had 11 – 20 years while 10.8% (n=8) had more than 25 years. Therefore, the majority of the educators had at most ten years in their current position or role.

The majority of the respondents, that is, 73.1% (n=57) were educators, 15.4% (n=12) were administrators like HoDs and deputy principals and 11.5% (n=9) were learner support educators. The current role did not impact in teachers' ICT perceptions of ICT in education, teacher competence, teaching using ICT, and curriculum enhancement except on "level of benefit perceived of ICT device in teaching in inclusive environments". Therefore, current role was a distinguishing factor in teacher perception on "level of benefit perceived of ICT device in teaching in inclusive environments" The main difference was between the educators and administrators with the educators having the lowest mean of 2.64 while the administrators had

the highest mean of 2.89. Thus, administrators were more in agreement on issues on level of benefit perceived of ICT device in teaching in inclusive environments than educators.

In terms of professional qualifications, 53.9% (n=41) had a 3 year diploma with teacher experience, 36.8% (n=28) had a bachelor's degree with teacher experience. Close to 7.9% (n=6) had only bachelor's degree while 1.3% (n=1) had a Master's degree. Therefore, very few respondents do not have teaching qualification. The major difference was between those with 3 year diploma + teacher experience and Bachelor's degree. Those with 3 year diploma + teacher experience had the lowest mean of 3.16 while those with Bachelor's degree had the highest mean of 3.63. Those with 3 year diploma + teacher experience had means close to three. This indicates that they were in agreement while those with Bachelor's degree had means close to four, indicating that they were agreeing **strongly**. Therefore, those with bachelor's degrees agreed strongly on teacher competence issues.

All p-values were greater than .05 and therefore, the means were equal in terms of the years in current position. The years in current position did not have any effect on teachers' perceptions of using ICT in education, teaching, professional development, and curriculum enhancement.

The ANOVA tests resulted in all p-values being insignificant as evidenced by p-values of more than .05 for age and teaching experience. Thus, age and teaching did not impact in teachers' perceptions of using ICT in education, teaching, professional development and curriculum enhancement by current role and were not a distinguishing factor in teacher perception. On the other hand, school and professional qualification had an impact on teacher competence while current role had an impact on level of benefit perceived of ICT device in teaching in inclusive environments.

The level of agreement on issues of teacher competence

All the aspects had an average of at least 2.5 and levels of agreement of more than 75%. This indicates that the respondents were in agreement except the aspect "working with ICT makes one feel tense and uncomfortable". The respondents were in disagreement that working with a computer makes one tense and uncomfortable and were in agreement that. it is very important for them to learn how to use ICTs, learning to operate ICTs is like learning any new skill - the more one practice, the better they become, knowing how to use ICT is a worthwhile skill and

that they are confident with their general ICT knowledge, for example, typing documents and using the Internet.

The level of agreement on issues of teaching using ICT

Majority of the respondents were in agreement that their teaching style can change when they integrate technology. However, the respondents were in disagreement on the learning to use ICT in teaching is a waste of time , capable teachers do not need ICT to teach, computers will only put more work on the shoulders of the teachers and using ICT can prevent me from being creative in teaching. Therefore, the respondents felt that the teachers are in need of ICT.

The level of agreement on issues of curriculum enhancements

The respondents are in agreement that the curriculum is not complex such that ICT cannot assist in making it simpler A large proportion agreed that some learners with learning barriers learn better with computers, and that would encourage the teacher to use computers to enhance the curriculum. There also agreed that using ICT can assist with flexible assessment for learners with barriers, ICT can give me flexibility to transform the curriculum to suite learners with barriers and that they need ICT to make the curriculum suitable for learners with barriers. The teachers assert that ICT in inclusive schools can be of benefit for teaching, curriculum enhancement and flexible assessment of learners with barriers.

The level of agreement on issues on ICT in education

A large proportion were in agreement that ICT can make teachers more flexible in teaching, ICTs are necessary for quality education, ICT could enhance remedial instruction and that their school computers offer them knowledge and information that assists in teaching. However, three out of four disagreed that the school budget was limited and upgrading ICT should not be an urgent priority. There is a sense that although ICT is a necessary budgetary item for flexible teaching, quality education and remedial instruction but because of budgetary constraints ICT should not be prioritised.

The level of agreement on issues on type of delivery method beneficial in receiving ICT training

The majority of the respondents indicated that these different delivery methods were not beneficial. About four out of ten indicated that out of district training, where training is held outside of their familiar geographic area i.e. held away) is least beneficial. In addition, three

out of five agreed that in-school building level training is least beneficial. Moreover, 7 out of ten indicated that district level in-service training is least beneficial and that coursework at college/university was least beneficial.

The level of agreement on issues on type of delivery method beneficial in receiving ICT training for teaching and learning of special education students

The same pattern observed in type of delivery method that one can receive in ICT training was also observed in ICT training and learning of special education students. The majority of the respondents also indicated that the aspects were not beneficial. About 4 out of ten indicated that out of district training is least beneficial while 7 out of 10 that coursework at college/university was least beneficial, in-school building level training is least beneficial and 71% indicated that that district level in-service training is least beneficial.

The level of agreement on issues on type of delivery method beneficial in receiving ICT training for teaching and learning of special education students

The same pattern observed in type of delivery method that one can receive in ICT training was also observed in ICT training and learning of special education students. The majority of the respondents also indicated that the aspects were not beneficial. About 40.4% indicated that out of district training is least beneficial while 69.5% indicated that coursework at college/university was least beneficial. In addition, 70.7% agreed that in-school building level training is least beneficial and 71% indicated that district level in-service training is least beneficial.

The level of agreement on issues on level of benefit perceived of ICT device in teaching in inclusive environments

The percentage of devices that were indicated as least beneficial were 46.4% smartphones, 74.6% Internet, 77.6% computer (desktop), 75.4% interactive/Smart whiteboard, 79.4% Tablet e.g. Ipad, 81% laptop and 88.1% educational software for learners with barriers. Therefore, the majority of the respondents indicated most of the ICT devices as least beneficial.

The level of agreement on issues on level of use of ICT devices

The proportion that used the ICT devices daily were 55% used the smartphone, 44% used the Internet, and 42% used laptop. *Occasionally* and *Not At All* were collapsed to determine those

who used the devices *rarely*. Therefore, the proportion who used the devices rarely were 52% computer (desktop), 66% tablet, 64% educational software and 69% Ipad.

5.2.5 The impact of teacher demographic factors on ICT-enhanced teaching and learning when mediated by perception

Objective: To explore the influence of educator demographics on their ICT perceptions.

Question: What are the perceptions of the teachers using ICT in education, teaching, professional development, and curriculum enhancement?

An exploration was conducted to understand the impact to which teachers' demographic variables of age, gender, current role, teacher experience, and professional qualification have on ICT-enhanced teaching and learning in Inclusive Schools. The study found that the demographic factor of ***age*** does not have an impact on ICT-enhanced teaching and learning in Inclusive Schools regardless of teacher ICT perceptions. This was in disagreement with Vitanova et al. (2014) who found that age, gender and experience had significant relationship with perceptions of ICT competence. UNESCO: Rights of Persons with disabilities (2012) observed that as age increases the teacher ICT competence score decreases, in Inclusive Schools this is not the case as age does not influence ICT perceptions and use even though the majority of the respondents were above 44 years. Teacher age may not be a concern for technology use. Becta (2004; 2007) and Scrimshaw (2004) in Sangra and Gonzalez-Sanmamed (2010) indicate that 'experienced older teachers have the ability to identify areas where computers can support and extend teaching and learning'. This could be the case in Inclusive Schools.

Gender did not have an impact on teachers' perceptions. This was in disagreement with (Motsi & Chimbo, 2017; Abu-Obaideh et al., 2012) who found that gender did have an influence on ICT use and uptake. There were equal mean scores on the dimensions by gender and therefore the perceptions were the same for both males and females. In Inclusive Schools within Johannesburg Central District, gender is not a determinant in distinguishing teachers' perceptions of using ICT in education, teacher competence, professional development and curriculum enhancement. The success of ICT-enhanced teaching and learning is not influenced by the gender cohort of teachers.

Morley (2011) found that teacher experience has more influence on teachers' use of technology in the classroom more than age and gender yet this study found that **Teaching experience** does not have an impact on teachers' ICT perceptions in Inclusive Schools. This result means that both the teachers who were part of the teaching cohort before these schools were converted from mainstream to Inclusive Schools and those who have recently joined have the same ICT perceptions. The data also show that newer teachers in the profession and older teachers have the same perceptions.

School has an impact on teachers perceptions of the their own ICT competence. This suggests teachers per school have different views about their ICT competence. The "school" as a unit plays a role in promoting a competent teacher cohort. There could be various factors that make the 'school' demographic for example in one of the interviews (Section 5.4), one of the principals said that "*Most of my teachers here are techno-savvy" and that they had told the principal that "Mam we want whiteboards in our classes."* The teachers themselves as a collective, can be a contributory factor in shaping the 'school.' Another principal had said that "*I have done my training in computer education; I think what makes it easier is that I am in a [sic] fore-front. I develop them- they must know everything.*" In this case, the principal, is playing a role in shaping the 'school'. The school environment plays a big role in building an ICT-competent teacher cohort.

The **current role** of the participants has influence on how they perceive the use of ICT in teaching. The roles were Educators, Learner Support Educators, HODs, Computer Specialists and SMTs. Many of these roles are found in the school and have an influence in creating that Inclusive School environment. It is critical to bring all stakeholders to one level of benefit of ICT device in teaching in inclusive environments.

Professional qualification has an impact on ICT-enhanced teaching and learning in Inclusive Schools. This was in agreement with Motsi and Chimbo (2017) who found that teachers' level of education influences their perceptions and attitudes towards ICT use. Teachers with Bachelor degrees, even though they were few in number, feel very strongly about obtaining ICT skills for Inclusive Schools while those with three-year diplomas + teaching experience, who were the majority of the cohort, feel less strong. This could mean that perhaps teachers with higher qualifications have had ICT skills training during their studies or perhaps that their bachelor's qualifications were more recent compared to the older diploma qualifications.

ICT-enhanced teaching and learning in Inclusive Schools within a developing country like South Africa can benefit from a teacher cohort that has positive views about the use of ICT in the school. ICT interventions and investments by the GDE (2011) will be met with ready and confident teacher cohort that is willing to receive ICTs training to enhance their own development to be able to teach in these new inclusive settings. Regardless of age, gender or teaching experience, teachers are positive in using ICT to enhance teaching and learning in Inclusive Schools. A bachelor's degree professional qualification has influence on ICT perceptions of teacher competence as compared to a three-year diploma with + experience. Capacitating teachers in continued professional development can benefit Inclusive Schools in that teachers may have more confidence in embracing ICT to enhance teaching and learning. Identifying and addressing teachers' personal barriers to Inclusive Education is a big stand to ICT-enhanced teaching and learning.

5.2.6 Teacher ICT Professional Development

Objective: To learn of the status of the teachers' ICT professional development in these Inclusive Schools.

Question: What is the status of the teacher's ICT professional development?

The principals argue that ICT resources could be made available after-hours as a platform for teacher ICT professional development through ICT training for their educators. This is emphasised by the notion from one of the principals that "I think that will play a big role in educators teaching practice" which is a very critical skill for the modern educator. Another view was that this could not be possible as the ICT resources or "the lab is off-line." Non-availability of resources poses a threat for teacher ICT professional development. This is critical where only <50% have attended ICT classes (Section 4.1.1.4). The European Union also observed that only 25% of students are taught by digitally confident and supportive teachers (European Commission, 2013). Inclusive ICT-enhanced teaching and learning environments require skilled personnel that are ready to provide teaching and learning to various learners with diverse learning needs. This will be possible when teachers are highly skilled in ICT use, which does not seem to be the case in these Inclusive Schools.

None of the Inclusive Schools has an active school website. If a school has limited Internet access, they may not be able to have an active school website. Having an active school website means that the school is reachable. Some materials can be posted on the school website -

material that the community who have learners with barriers can access after-hours for further study or practice.

E-mail for staff members

E-mails provide a speedier avenue for educators to communicate with other educators on matters for example pertaining to pedagogy enhancement, share beneficial teaching and learning material for all types of diverse learners. Updates to pertinent policy issues related to ICT-enhanced teaching and learning can be received through e-mail- this promotes a well-informed and skilled workforce.

Introductory courses on internet use: This study has found that teachers lacked on how to use the Internet. The Internet plays a crucial role in ICT-enhanced teaching and learning. Therefore, a tech-skilled labour force is required to operate continued professional development (CPD) initiatives must encourage more teachers to be afforded the opportunity of developing their ICT skills - especially on Internet use. This will contribute to a dynamic and skilled teaching labour force which is a strong requirement in ICT-enhanced teaching and learning. Some teachers use the Internet and ICTs to search for teaching material and for resources that enhance instructional strategies (Ibieta et al., 2017).

ICT teacher training: This study found that only about 25% of teachers had attended *training on the use of ICT equipment* like laptops, interactive whiteboards etc. and that less than 25% had attended training *Courses on the pedagogical use of ICT in teaching and learning*. This reflects that teachers' ICT training is lacking, especially in learning how to use ICT in pedagogy. This is a critical skill in Inclusive Schools as the learner cohort is very diverse. ICT hardware like interactive whiteboards is now used to provide teaching and learning in progressive educational environments. They provided ease of teaching and learning for various learning needs (Muttappallymyalil et al., 2016). In these Inclusive Schools, teachers are not adequately skilled in the latest technologies that are required in inclusive classrooms (to facilitate ICT-enhanced teaching and learning) as more than 75% do not have *training on how to use multimedia (using digital video, audio equipment, etc.). Participation in peer learning communities or group work with other teachers about the use of ICT for learning and teaching* had occurred for some teachers. However, the majority of the teachers had no opportunity for peer learning. Peer learning could augment the skills shortage as teachers will be imparting direct knowledge and lived-experiences in their environments with other teachers. There are

different professional development opportunities that can be harnessed by Inclusive Schools, but these Inclusive Schools have only exposed less 50% of their teaching cohort to *Other professional development opportunities related to ICT*.

About 70% of teachers have indicated that *Coursework at college/university, training within the school-building and District level in-service training* is least beneficial to them receiving general ICT training and training on how to use ICT in teaching and learning of special needs learners (Section 4.3.1.5 and 4.3.1.6). There is a need for novel strategies for ICT training for teachers in Inclusive Schools.

Summary

The status of teacher ICT professional development is not satisfactory. Inclusive Schools have no school websites. This at times also contain school policies and bulletins; teachers have very limited access to e-mail, which makes it difficult to communicate with other peers; specific training on how to use special equipment like interactive whiteboards, laptops, the Internet and multimedia for pedagogy is lacking; and participation in peer learning by teachers is lacking.

5.2.7 Identified School Inadequacies

Objective: To identify critical school inadequacies that need to be addressed to assist these Inclusive Schools in moving towards an integrated ICT teaching and learning environment.

Question: What are the inadequacies that need to be addressed to assist these Inclusive Schools in moving towards ICT-enhanced teaching and learning?

All the principals agree with the following four issues as inadequacies that hinder them from offering ICT-enhanced teaching and learning in their Inclusive Schools:

Internet / bandwidth, Teacher's ICT skills, School space organisation (classroom size and furniture) and school security concerns with theft of ICT hardware. Internet connectivity issues are vital as alluded in Section 4.1.1.1. Internet connectivity is a policy mandate from the Department of Education (e-Education White Paper, 2004). Internet connectivity includes any other contracted services that the education authority has procured for the provision of school technology. Inclusive Schools thrive on this as they provide teaching and learning for learners with variable needs. When teachers' ICT skills are indicated as an inadequacy, it means that no matter how accessible the technology is for ICT-lead teaching and learning, if the teachers are not skilled to teach using the ICT, it will be a futile exercise. This promotes the "white

elephant" scenario in schools where at times ICT may gather dust or be placed in storerooms owing to non-use. Classroom size is a concern because of the demands of learner-centred teaching and learning approaches. If there is a need for ICTs to have a direct contribution and impact on the 'learning process in core subjects, you need to put them where core subjects are being taught -- like in the classroom' (Trucano, 2011). School security concerns threaten the motivation for ICT-enhanced teaching and learning. The great threat posed by theft of school ICT infrastructure brings fear and this impacts on any measures taken to provide ICT-enhanced teaching and learning. In fact, theft and attempted theft of ICT contributes to diminished interest in pursuing ICT-enhanced teaching and learning and this becomes a draw-back- as exemplified in one school that had 40 Ipads that are not utilised in the school but are merely in the storeroom gathering dust.

From the results, it is evident that there is a stark need for usable and available ICT and the skilling of educators on how to provide ICT-enhanced teaching and learning, including the resources necessary. There are limited computers in Inclusive Schools, and they are either out-of-date, broken or off-line. Inclusive Schools also expressed challenges with integrating ICT use into the curriculum and lacked teaching models on how to use ICT for learning.

5.3 The state of ICT-enhanced teaching and learning in Inclusive Schools

The researcher revisited the four principals of these Inclusive Schools in Johannesburg District to determine the state of ICT implementation in their schools five years later. This affordance was due to the pragmatic nature of the study which afforded the researcher further exploratory enquiry. Semi-structured interviews were used to collect this information from the principals on the factors of: School ICT infrastructure, School ICT policy, Community support and professional development of teachers. The short semi-structured interviews were used to understand the current status of the schools and yielded the following responses.

5.3.1 School ICT infrastructure, Funding and Security issues

The current status of Inclusive Schools indicates a very harsh reality of lack of ICT infrastructure due to various dilemmas; funding and security issues. Some schools have not been able to move forward towards that goal of ICT-enhanced teaching and learning due to lack of government funding as one principal mentioned that "*because we are relying on the government, if the government is doing nothing about it, everything is still the way it was*." All

these Inclusive Schools rely on private sponsorships and their own funding to realise some of their goals. As one principal said that "*it does not mean that we just sat and did nothing. We kept on looking around, finding out if we can get sponsorship or anybody else that can assist. It was difficult*"; and another emphasised the state of affairs on funding by informing that "*Yes, everybody has to fend for himself"* so *"we fundraised so that we can get smartboards for each grade in the beginning. You see we had a plan to buy four smartboards per year until every classroom has one; but after making quotations we stopped as we heard on the news about a school that had a burglary and they stole the smartboards"* "*In our fundraising budget, we had planned to have the smartboards and 'warm bodies' for a security company to secure the ICTs*". One school has only one laptop that is shared amongst seven educators in a grade. There are 6 grades in this school. This laptop is not used directly for teaching and learning but for preparing lessons and typing out documents. These laptops were bought by the school through their fundraising initiatives. It would seem that the Department is failing to supply these ICT to the schools and there exists very poor communication to the schools on what their strategy is, as one principal said that "*Some months back we had forty tablets that were in the store-room but were recalled back by the Department. We thought the Department was going to be brining something else to us, but nothing has happened up to now*" and another principal highlighted this by stating that "*To be honest with you we are moving backward- schools are nowhere. Maybe I would say when you last came, we were hoping that we were getting somewhere because we had our Gauteng Online and we were hoping that we shall going [sic] to have some programmes for our learners with challenges- even then it only caters for learners in the mainstream. So, the tablets and the Gauteng Online, it's now called Gauteng off-line. The tablets were taken from us to install a tracking device on them. Time went by and we were informed that they were given to grade twelves*"; and another principal concurred with this notion by articulating that "*Yes, the computer laboratory, it never took off. In other words, they kept on saying they are going to improve- at that time I think we did not have a server because it was stolen and a couple of IT stuff. They never repaired. They never did anything. They kept on promising us that a new service provider is coming to ascertain that the IT thing takes off*" The principals seem to have a very positive outlook in terms of ICT use in teaching and learning as one said that *"Yes, we do have a computer lab with the old pc's; but it is not functional- it is that Gauteng "offline" but we now have a digital library that was sponsored to us. It has four laptops, and a smartboard. Learners go to the library to learn; it is part of the curriculum to go. We want to have smartboards for every class because the size can accommodate a smartboard. It is time to move with the times and get rid of the chalkboard"* whilst in another

school their desire to move on with the times was also abruptly halted by an ever-present school and ICT security threat:

"*They [private company] said they are going to provide every child with a laptop; but in fact, let me say each and every station in the lab is going to have a laptop- about forty-five of them. They said they are going to redesign the whole section inside- they will put up the laptops and then they will get security for them. In fact, they started by saying that with the money they are giving me can't I get a security company that can be of a twenty-four hour and take care of the area so that the equipment can be safe. They said this project has started elsewhere- especially in the East Rand and they knew about those challenges. They spoke of those challenges of security. They wanted to know when was the last time we had a burglary in the school and I indicated to them that it's well over eight to nine years that we have not been having burglaries because we do have a buy-in in the community. Our community loves the school. I interact a lot with them. They take it upon themselves to protect the school; but as soon as they heard about the story of the burglary, they [private company] stopped the whole thing and said until further notice. Otherwise you would have found technology here in the school- being up and running. Can you imagine all the schools the Gauteng MEC for Education has opened; I think they are about four- all of them have been burgled. So, who is going to fund them? Who is willing to fund them? You see that it is a problem- if they can address the issue of crime, I think maybe there can be direction. Crime is such a big problem- especially in schools. It's a very serious problem. Well, I am saying, it is now about eight years without having burglaries- even the incidences that happened about eight to ten years ago were not that serious. We can say we are lucky. In the neighbouring school, they opened the roof and took all the computers they had, machines and so forth. We are lucky, just lucky that we are still surviving*"

A principal in another school summed up the state of ICT-enhanced teaching and learning in their school- based on the factors explored in this study:

"*There's no more Gauteng Online. It just came to a halt, total halt. Nothing! Nothing! We had a laboratory, which was the Gauteng Online but now it has been replaced by a one point five million library. All the computers that were there, we stored them. We had to store it because it is not ours to give away or get rid of. We've stored it, some in our storeroom. There was a decision to use that space and the library opportunity came through. It is funded by a [private company]. It's an amazing library. Well, there's an interactive board, there are six laptops which are taken out during the day which the children can work on to do research…* ***the private***

sector is playing a big role *and yes, they will have to come in! I'm looking at… I need to have a laboratory… a lab- I need a computer lab because my teachers are already asking for white boards. It's for themselves "Mam we want whiteboards in our classes". Most of my teachers here are techno-savvy. How are we going to bring technology in if we don't have a lab and you want to teach? We've got the library and the library is used by a timetable. So teachers go in there and use the interactive whiteboard, they go and use the programme that is there. I've got young teachers. Most of them are young, most of them are young. The oldest teacher is retiring now in January. I have actually forced my teachers to work on computers. So, it took me a while to get people to… I wanted name lists typed. I wanted your mark lists typed. I don't want anything handwritten. You do everything with a computer. We want to try and do things technologically because we are in the twenty-first century. We are fourth industrial revolution. Even if we are a full-service school, you've got start trying to get into that space. I am going to buy… teachers were asking for projectors that they can use in their classes. So, I said "good we can buy two- one for the foundation phase and one for the intermediate phase. And you can book it out and use." They are using laptops- teachers have their own laptops*."

These laptops are personal laptops that the teachers bring to school to support their teaching in the schools. This means that schools have to devise their own methods for the provision of ICT resources to enhance teaching and learning; hence the strong view and undeniable role the private sector plays in this endeavour. A sustainable ICT funding model is necessary for Inclusive Schools to realise their set goals- as the Department has not been able to sustainably provide the necessary ICT to the schools.

It is evident that schools have unique circumstances that they operate under. Although this study sought to have an overarching view of ICT-enhanced teaching and learning in Inclusive Schools in Johannesburg Central District, the unique states of the four schools under the lens cannot be ignored.

5.3.2 School ICT policy

The role of ICT policy has not been a strategic one in the pursuit of a functional, implementable and ICT-enhanced teaching and learning in Inclusive Schools. Due to ICT implementation (or lack of), that has been sporadic, full of let-downs and non-coordinated. Principals seem to have a view that School ICT policy would have been an engagement had there been a sustained and progressive ICT implementation. For these sentiments, full of disappointment, were stated as

follows: "*We have a generic one [School ICT policy] just so that if they [Educational Authorities] look for one they can find it in the file because where are we going to use it, you understand.*" This view seems to suggest that School ICT policy, has not taken a role of driving ICT implementation.

"Yes we have it [School ICT Policy]…for the sake of just having it. I mean for obvious reasons. I don't particularly know why we had it- in fact we adopted one that we got from elsewhere if I'm not mistaken. I think we have it because we have an IT guy" In this instance also, the role of the School ICT policy has not been understood.

"We thought we were going to use it [School ICT Policy], remember when we were still excited that we might be [sic] started the whole thing of ICT. Things got so bad. We had a programme of 25 kids per class on different [levels]who would visit the lab. He [the school's IT guy] would teach them, a skill or two on the programme [educational programmes provided through Gauteng Online]- it did help. From two o'clock to three o'clock [during weekdays, after school contact time] he would invite parents – especially those we identified as being dedicated to the school. We invited them and he would teach them computers. That used to have a very serious impact and it was a very nice thing- had it continued; I don't know where we would be now" The principal has shifted the role of the School ICT policy to an after implementation footprint instead of a blueprint for what is to come. A question arises as to whether principals are adequately skilled to draw and implement School ICT policy.

5.3.3 Community support

Inclusive Schools have a strong view to support the community with Special Needs learners by incorporating their immediate families; yet there is a strong sense of burden due to the safety and security concerns of School ICT infrastructure. In the school where a burglary had occurred, whilst having secured an armed-response company, the principal said that "*we become worried as we currently do a crash-course for the grandmothers to assist their grandchildren but not the parents themselves because whilst you are teaching the parents they are thinking how are they going to steal the ICTs.*" In another school, a principal shared a similar view of having a concern regarding providing access to ICT access to the community by stating that after he had spoken to the parents who had supported the school, *"they indicated to me that it is a brilliant idea. They said it was going to influence [sic]; although there was*

an element of security, that we might be compromising security, you never know who is coming and what is he thinking of."

5.3.4 Professional development of teachers in using ICT for teaching and learning

"I think it's about one, two or three- they are the BBTs, they call them Born Before Technology. There are few BBTs but even some BBTs like myself – I have done my training in computer education; I think what makes it easier is that I am in a fore-front. I develop them- they must know everything. They must use social media and not just say I only facebook [sic]. What about Twitter, Instagram and so forth. They must be progressive in what they do. Moreover, we have a younger cohort that have done computers in university not like us who did not have opportunity in our old teacher colleges. That does not mean that one must just sit and not move with the times."

5.4 Summary

This chapter discussed the factors that were investigated in this rudimentary study in a period of five years. Chapter 6 concludes this study by stating recommendations, contributions and future research work.

CHAPTER 6:

RECOMMENDATIONS AND CONCLUSION

6.0 Introduction

This rudimentary study investigated the extent of ICT-enhanced teaching and learning in Inclusive Schools within Johannesburg Central District by exploring factors that contribute to the success of such a learning system. The stance from various literature and research has shown that when properly implemented, ICT-enhanced learning can benefit Inclusive Schools by leveraging efforts on teaching and learning; teacher ICT professional development and community support. The following recommendations have been made to address the factors under this investigation.

- **School level barriers:** Good quality ICT infrastructure, hardware or software and the Internet is key in any technology-led environment. No infrastructure or poor-quality infrastructure, lack of maintenance and upgrade of ICT is detrimental to an effective environment.
- **Teacher-level barriers:** As teachers play a central role in teaching, inadequate ICT skills and insufficient training and teacher support lead to barriers. According to Donohue and Bornman (2014), successful implementation of any new teaching and learning strategy rests on the school leadership and other school personnel who create a culture and have an ability to challenge or support the change. Current teacher education has produced teachers equipped with the knowledge of teaching in a single classroom, at times in overcrowded classrooms. On the contrary, the inclusive system adds the challenge of accommodating learners with variable strengths. Teachers need upskilling and a tremendous shift in pedagogical views to be able to use technology as part of their new skill set. In Tubin and Chen's (2002) study, after supply of computers and laptops to teachers, students were delayed with having access to computers because teachers had not had the mastery of the computers.
- **System-level barriers:** ICT implementation as part of national education policy is well and good but the day-to-day implementation and utilisation of ICTs in a dynamic curriculum and educational environment; and budget-constrained system may pose a very serious dilemma.

6.1 Recommendations

The main aim of this research was to investigate ICT-related factors that contribute to e-Education in Inclusive Schools. Subsequent to the findings of this research, following sub-sections make recommendations for addressing the problems experienced in Inclusive Schools.

6.1.1 School ICT Infrastructure

Inclusive Schools' ICT infrastructure is not conducive for ICT-enhanced teaching and learning. The ICT resources are scanty and non-operational. They have become the 'elephant in the room'. Even where there is availability of mobile current technology like tablets, they are not in use owing to previous theft issues. Therefore, ICT-enhanced teaching and learning is thwarted in Inclusive Schools. We hope the DBE will take note of the adverse paucity of ICT resources, including its safety and security. Inclusive Schools need to be supported to have a secure ICT infrasture that will move the schools towards the desired goal of ICT-enhanced teaching and learing. The role of the District IT Technician (DBE, 2016) should be examined again with the view of the adverse challenges that face Inclusive Schools.

6.1.2 School ICT Policy

Inclusive Schools lack proper school ICT policy that should drive the schools agenda. Policy serves as a guide for implementation and governance in schools. Inclusive Schools should be assisted to draft and use inclusive ICT policy that speaks to all the facets and dimensions of their schools' ICT implementation - the 'where, what, how, when and who'.

6.1.3 ICT Community Support

The notion of supporting the community with resources through the school is an ideal purpoted by the White Paper but the implementation of which are at this juncture impractical owing to security issues that persist. Inclusive Schools are willing to open up resources for the community and families to benefit on Saturdays and during school holidays but issues of theft linger on in the minds of school leadership. There has to be strategies found to build a trust relationship between the communities, families and the school - including security measures to protect school property. This study has raised an awareness and highlighted issues of ICT Community Support in schools so that families and/or communities with learners with Special Needs can perhaps have access to assistive technology support in school premises outside of the normal school hours.

6.1.4 Teacher ICT Perceptions and demographic factors

With positive teacher ICT perceptions, the first hurdle to ICT-enhanced is overcome. The fact that both the younger and older teaching cohort have positive views of ICT is encouraging - this means that teachers are open to utilising ICT in teaching and learning. This study found that there are three demographic factors that may influence teachers' ICT perceptions – school, current role and professional qualification. It is therefore recommended that teachers be encouraged to further their professional qualification because this study has shown that this demographic does have significant influence on ICT-enhanced teaching and learning through perceptions. Let this stance be leveraged with ongoing positive reinforcement by training and constantly obtaining feedback from the teachers so that they voice out challenges, which can lead to teacher-level barriers. The school itself plays a very critical part in influencing teachers' perceptions. Further analysis of the school structure and environmnet should be conducted to understand which aspects of 'school' really influence teachers' perceptions.

6.1.5 Teacher ICT Professional Development

Opportunities for Teachers ICT Professional Development must be thrust in focus as soon as possible. Morley (2011) found that teachers' major concern was finding time 'to keep pace or develop their ICT skills'. A community of practice, mobile technologies and collaborative platforms can be used to foster Teachers' ICT Professional Development. These opportunities could be such that school-based learning efforts are harnessed. Institutions of higher learning, the DBE and the private sector can find ways to upskill their teachers in Inclusive Schools. Currently, teachers have not attended training that will improve creative thinking and flexible pedagogy in Inclusive Schools. Adequately trained and well-equipped staff are critical to the success of inclusive environments. There is a high potential for the introduction of possible ICT skill sets to assist teachers in the dissemination of curriculum content for all types of learners. Even though DBE has a plan to accelerate teachers ICT training by 2019, the plan needs to be realistic given the massiveness of the challenge (DBE, 2016).

6.1.6 Identified inadequacies

Principals identified four high priority inadequacies that plague their schools to move towards ICT-enhanced teaching and learning. It is recommended that education authorities take note of these critical concerns as they directly impede on Inclusive Schools moving towards ICT-enhanced teaching and learning. There needs to be a strategic supply of sustainable Internet/bandwidth in Inclusive Schools. More importantly, teachers urgently need ongoing

ICT skills training. Therefore, re-organisation of school spaces to accommodate ICT implementation should be on the ICT planning agenda. Moreover, school and ICT security need to be tightened as ICT theft affects access and availability of ICT and thwarts any possible efforts for school community ICT support for families of learners with Special Needs.

6.2 Conclusion

This rudimentary research laid a foundation for further research into ICT-enhanced teaching and learning in Inclusive Schools. The findings indicate that Inclusive Schools within Johannesburg Central District are not moving towards ICT-enhanced teaching and learning owing system-level and school-level barriers. Teacher-level barriers were not present.

6.3 Contributions and future research

Inclusive Education is an ongoing process. Our main research for this rudimentary study was to find out the extent of ICT-enhanced teaching and learning in Inclusive Schools. It was found that available ICT resources are scarce and not operational. Inclusive Schools are using old technology like desktop computers that are housed in the laboratory. Therefore, mobile technologies like iPads, iPods, and smartphones can be used to augment the current technology landscape. Issues of ICT theft and ICT security remain on top of the agenda for securing valuable resources that are used in ICT-enhanced teaching and learning. Teachers are change agents and their Teacher ICT skills need a total overhaul for inclusive teachers to engage with all types of learners who may need much specialised technology to access basisc education in Inclusive classrooms. There must be a person responsible to act as a point of contact for continuous Teachers' ICT Professional Development and qualifications, for professional exchange of multi-professional teams in Inclusive Schools (Skoglund & Stacker, 2016). The fact that teachers had very positive perceptions on ICT use in Inclusive Schools is very encouraging as there was no significant influence of teacher characteristics on their ICT perceptions. Therefore, teachers in Inclusive Schools may be ready for ICT-enhanced teaching and learning. Fullan (1996) observes a phenomenon where old assumptions and practices that have governed schooling for many years rarely change - he calls this "the awful inertia of past decades." All role players should therefore contribute to a sustainable ICT-enhanced teaching and learning. Muttappallymyalil et al. (2016) warn though that we need to "strike a balance between embracing new methods of teaching and learning while holding on to the timeless principles of education." Inclusive education presents dynamic teaching and learning environments where innovation, flexibility and creative pedagogy can enhance learning and

teaching. ICT-enhanced teaching and learning encourages new ways of thinking about challenges in the pursuit of teaching all types of learners in inclusive settings; therefore, sustainable funding models are pivotal in assuring learning undisrupted teaching and learning offerings. Parents and the community of learners with barriers must be given an opportunity to engage with research that informs school changing practice, alongside teachers (Skoglund & Stacker, 2016). Inclusive education must always be the point of departure; the 'where and how ICTs can be used' - be the final step (GIZ Science to Policy Brief, 2016).

Further in-depth research would need to be undertaken to explore:

- How teachers use ICT within an inclusive classroom- in practice.
- How learners use ICT within an inclusive classroom- in practice
- The application of novel technology to assist teachers' ICT Professional Development that is school-based.
- Investigate options for sustainable technology implementation e.g. Internet, Wi-Fi and other enablers of ICT-enhanced teaching and learning in Inclusive Schools.
- ICT Community Support - the use of ICT to extend learning opportunities, beyond normal contact time, for learners experiencing barriers in an Inclusive School
- A sustainable ICT funding model for Inclusive public schools and incentives for private sector involvement
- The role of the principal and school environment that contributes to a thriving and competent teacher cohort in an Inclusive School
- Sustainable school-family-community partnerships that promote school and ICT security in a thriving Inclusive School
- Teachers, Learner Support Educators and Administrators- their roles in an Inclusive School and ICT competence

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ANNEXURE A: Gauteng Department of Education Permission

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE AMENDED RESEARCH APPROVAL LETTER

Date:	**16 September 2019**
Validity of Research Approval:	**04 February 2019 – 30 September 2019** **D2015/315A**
Name of Researcher:	**Hlengwa C.L**
Address of Researcher:	**10 Owl Ridge**
	30 Kliprand Street, Discovery
	Roodepoort, 1709
Telephone Number:	**073 447 0281**
Email address:	**charllyhlengwa@gmail.co.za**
Research Topic:	**Towards ICT-enhanced teaching and learning in inclusive schools: A rudimentary study in Johannesburg Central District.**
Type of qualification	**MSc Computing**
Number and type of schools:	**Four Primary Schools**
District/s/HO	**Johannesburg Central**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

16/09/2019

1

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

ANNEXURE B1: Ethical Clearance

UNISA | college of science, engineering and technology

Dear Mrs Charlotte Lungile Hlengwa (37284517)

Date: 2015-02-25

Application number:
010/CLH/2015

REQUEST FOR ETHICAL CLEARANCE: (A case study of ICT related educational factors that improve the realization of ICT benefits for teaching and learning of autistic children within inclusive schools: Johannesburg Central District)

The College of Science, Engineering and Technology's (CSET) Research and Ethics Committee has considered the relevant parts of the studies relating to the abovementioned research project and research methodology and is pleased to inform you that ethical clearance is granted for your research study as set out in your proposal and application for ethical clearance.

Therefore, involved parties may also consider ethics approval as granted. However, the permission granted must not be misconstrued as constituting an instruction from the CSET Executive or the CSET CRIC that sampled interviewees (if applicable) are compelled to take part in the research project. All interviewees retain their individual right to decide whether to participate or not.

We trust that the research will be undertaken in a manner that is respectful of the rights and integrity of those who volunteer to participate, as stipulated in the UNISA Research Ethics policy. The policy can be found at the following URL:
http://cm.unisa.ac.za/contents/departments/res_policies/docs/ResearchEthicsPolicy_apprvCounc_21Sept07.pdf

Please note that the ethical clearance is granted for the duration of this project and if you subsequently do a follow-up study that requires the use of a different research instrument, you will have to submit an addendum to this application, explaining the purpose of the follow-up study and attach the new instrument along with a comprehensive information document and consent form.

Yours sincerely

Prof Ernest Mnkandla
Chair: College of Science, Engineering and Technology Ethics Sub-Committee

Prof IOG Moche
Executive Dean: College of Science, Engineering and Technology

RECEIVED
2015 -02- 26
OFFICE OF THE EXECUTIVE DEAN
College of Science, Engineering and Technology

University of South Africa
College of Science, Engineering and Technology
The Science Campus
C/o Christiaan de Wet Road and Pioneer Avenue,
Florida Park, Roodepoort
Private Bag X6, Florida, 1710
www.unisa.ac.za/cset

UNISA | college of science, engineering and technology

ANNEXURE B2: Updated Ethical Clearance

UNISA

UNISA COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY'S (CSET) ETHICS REVIEW COMMITTEE

08/03/21

ERC Reference #: 2021/CSET/SOC/007
Name: Charlotte Lungile Hlengwa
Student #: 90222768 / 37284517
Staff #:

Dear Ms Hlengwa

Decision: Ethics Approval from 08/03/21 for three years (Humans involved)

Researcher(s): Charlotte Lungile Hlengwa hlengcl@unisa.ac.za 011 670-9281

Supervisor (s): Dr. B Chimbo chimbb@unisa.ac.za 0116709105

Working title of research:

Towards ICT-enhanced Teaching and Learning in Inclusive Schools: a rudimentary study in Johannesburg Central District

Qualification: MSc in computing

Thank you for the application for research ethics clearance by the Unisa College of Science, Engineering and Technology's (CSET) Ethics Review Committee for the above mentioned research. Ethics approval is granted for *3 years (low Risk M and non-degree studies 3 years)/5 years (PhD studies)*.

Open Rubric

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

*The **"negligible/low/medium/high" risk application** was expedited by the College of Science, Engineering and Technology's (CSET) Ethics Review Committee on "decision date" in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment. The decision will be tabled at the next Committee meeting for ratification.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa COVID-19 position statement on research ethics attached.
2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the College of Science, Engineering and Technology's (CSET) Ethics Review Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
8. No field work activities may continue after the expiry date "expiry date". Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.
9. "Permission to conduct research involving UNISA employees, students and data should be obtained from the Research Permissions Subcommittee (RPSC) prior to commencing field work."

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10. *Permission to conduct this research should be obtained from the [company, CE organisation, DoE, etc name] prior to commencing field work.*

Note
The reference number 2020/CSET/SOC/077 should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Yours sincerely,

Chair of School of Computing Ethics Review Subcommittee
College of Science, Engineering and Technology (CSET)
E-mail: dbischof@unisa.ac.za
Tel: (011) 471-2109

Prof. E Mnkandla
Director: School of Computing
College of Science Engineering and Technology (CSET)
E-mail: mnkane@unisa.ac.za
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Prof. B Mamba
Executive Dean
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ANNEXURE C: Questionnaire Cover Page

	The questionnaire attached is part of a research which intends to gather responses from educators/principals like yourself and educators/principals involved in the provision of inclusive education. **By completing this questionnaire you will be making an important contribution to the debate about the future of ICT use in Special Education Needs, teacher training, community support and inclusive policy issues in inclusive primary schools. PLEASE RETURN YOUR COMPLETED questionnaire to your school principal ON / BEFORE 20 February 2015.** ********* **The results of the survey will be sent to the Gauteng Department of Education. Copies of the report will be made available to the relevant authorities.** **Many thanks for your time.**
	Please note that your participation in this survey is voluntary and by no means binding. You may choose to withdraw from the research at any time without any negative or undesirable consequences to you. **Your anonymity will be ensured where appropriate.** **Your responses will be treated in a confidential manner.** **There are no incentives or rewards for participating in this survey.**
	Researcher: Mrs Charlotte L Hlengwa - 0734470281 **Supervisor: Mrs Bester Chimbo - 011 670-9105** **Institution: School of Computing** **College of Science, Engineering and Technology** **University of South Africa**
Consent	**I---------- am aware of the purpose and procedures of this study and hereby agree to participate. I am also aware that the results will be used for course purposes only and that my identity will remain confidential and that I can withdraw at any time if I so wish.** **Signature: ..... Date: .....**

ANNEXURE D: Teacher Questionnaire

A multi-case study of ICT related educational factors that affect the realization of ICT-enhanced teaching and learning: a rudimentary study of ICT related factors within Inclusive Schools in Johannesburg Central District

EDUCATOR QUESTIONNAIRE

PART A- Biographical and Background Information

*By use of **X**, please choose one response for each item in 1.1 to 1.4*

1 What is your age group?

◯ 25 - 34 ◯ 35 - 44 ◯ 45 - 54 ◯ 55 - 64

2 What is your sex?

◯ Female ◯ Male

3 Years of teaching experience?

◯ 1-5 years ◯ 6-10 years ◯ 11-15 years ◯ 16-20 years ◯ 21-25 years ◯ > 25 years

4 Years in the current position?

◯ 1-5 years ◯ 6-10 years ◯ 11-15 years ◯ 16-20 years ◯ 21-25 years ◯ > 25 years

5 Current role

*(By use of **X**, please choose whichever is appropriate to you)*

☐ Educator ☐ Learner Support Educator ☐ HOD ☐ Deputy Principal ☐ Computer Specialist ☐ SMT member

6 Professional qualification

*(By use of **X**, place a response that best summarises your current level professional qualification)*

◯ **2 year teacher certificate** ◯ **3 year diploma + teaching experience**

◯ **Bachelor's degree** ◯ **Bachelor's degree + teaching experience**

◯ **Masters degree** ◯ **Masters degree + teaching experience**

PART B- Teacher perceptions

7 Teacher competence, teaching using ICT, Curriculum enhancement and ICT in education

*For each statement, indicate with a **✓** or **X**, a response that best describes your perception.*

		General ICT perceptions	*Strongly Disagree*	*Disagree*	*Agree*	*Strongly Agree*
a	*Teacher competence*	Knowing how to use ICT is a worthwhile skill	◯	◯	◯	◯
b		It is very important for me to learn how to use ICTs	◯	◯	◯	◯
c		Learning to operate ICTs is like learning any new skill -the more you practice, the better you become	◯	◯	◯	◯
d		Working with ICT makes me feel tense and uncomfortable	◯	◯	◯	◯
e		I am confident with my general ICT knowledge for example typing documents and using the Internet	◯	◯	◯	◯
f	*Teaching using ICT*	Learning to use ICT in teaching is a waste of time	◯	◯	◯	◯
g		Capable teachers do not need ICT to teach efficiently	◯	◯	◯	◯
h		Computers will only put more work on the shoulders of the teachers	◯	◯	◯	◯
i		Using ICT can prevent me from being creative in teaching	◯	◯	◯	◯
j		My teaching style can change when I intergrate technology	◯	◯	◯	◯
k	*Curriculum enhancement*	If some students with learning barriers learn better with computers, that would encourage me to use computers to enhance the curriculum	◯	◯	◯	◯
l		ICT can give me flexibility to transform the curriculum to suite learners with barriers	◯	◯	◯	◯
m		I need ICT to make the curriculum suitable for learners with barriers	◯	◯	◯	◯
n		Using ICT can assist with flexible assessment for learners with barriers	◯	◯	◯	◯
o		The curriculum is very complex therefore ICT cannot assist in making it simpler	◯	◯	◯	◯

			Strongly Disagree	Disagree	Agree	Strongly Agree
p	ICT in education	ICTs are necessary for quality education	○	○	○	○
q		Using ICT can make teachers more flexible in teaching	○	○	○	○
r		Our school computers offer me knowledge and information that assists in teaching	○	○	○	○
s		ICT could enhance remedial instruction	○	○	○	○
t		When school budget is limited, upgrading ICT should not be an urgent priority	○	○	○	○

8 What type of delivery method do you believe would benefit you most in receiving ICT training?

	(By use of X, for each line choose one that mostly applies)	Most beneficial	Less beneficial	Least beneficial
a	District level in-service training	○	○	○
b	Out of District training	○	○	○
c	Coursework at college/university	○	○	○
d	In-school building level training	○	○	○

Please list other training delivery methods for ICT training that you believe would be most beneficial:

e	

9 What type of delivery method do you believe would benefit you most in receiving training regarding using ICT for teaching and learning of special education students in your classroom?

	(By use of X, for each line choose one that mostly applies)	Most beneficial	Less beneficial	Least beneficial
a	District level in-service training	○	○	○
b	Out of District training	○	○	○
c	Coursework at college/university	○	○	○
d	In-school building level training	○	○	○

10 What level of benefit do you perceive the following ICT can have in your teaching in inclusive environments?

	(By use of X, for each line choose one that mostly applies)	Most beneficial	Less beneficial	Least beneficial
a	Smart phone	○	○	○
b	Internet	○	○	○
c	Tablet e.g. Ipad	○	○	○
d	Interactive/Smart whiteboard	○	○	○
e	Educational software for learners with barriers	○	○	○
f	Computer (desktop)	○	○	○
g	Laptop	○	○	○

11 Please indicate if you have regular access to one or more of the following devices (even if not your own)?

	(By use of X, for each line choose one that mostly applies)	Not at all	Daily	Monthly	Weekly	Occassionally
a	Computer (desktop)	○	○	○	○	○
b	Laptop	○	○	○	○	○
c	Ipad	○	○	○	○	○
d	Internet	○	○	○	○	○
e	Educational software	○	○	○	○	○
f	Smartphone	○	○	○	○	○
g	Tablet e.g. Ipad	○	○	○	○	○

APPENDIX E: Principals Questionnaire

A multi-case study of ICT related educational factors that affect the realization of ICT-enhanced teaching and learning: a rudimentary study of ICT related factors within Inclusive Schools in Johannesburg Central District

PART A- Biographical and Background Information

*By use of **X**, please choose a response for items 1.1 to 1.4*

1 What is your age group?

◯ 25 - 34 ◯ 35 - 44 ◯ 45 - 54 ◯ 55 - 64 ◯

2 What is your sex?

◯ Female ◯ Male

3 Years of teaching experience?

◯ 1-5 years ◯ 6-10 years ◯ 11-15 years ◯ 16-20 years ◯ 21-25 years ◯ > 25 years

4 Years in the current position?

◯ 1-5 years ◯ 6-10 years ◯ 11-15 years ◯ 16-20 years ◯ 21-25 years ◯ > 25 years

5 Current role

*(By use of **X**, please choose whichever is appropriate to you)*

☐ Educator ☐ Learner Support Educator ☐ HOD ☐ Principal ☐ Deputy Principal ☐ Computer Specialist

6 Professional qualification

*(By use of **X**, place a response that best summarises your current level professional qualification)*

◯ **2 year teacher certificate** ◯ **3 year diploma + teaching experience**

◯ **Bachelor's degree** ◯ **Bachelor's degree + teaching experience**

◯ **Masters degree** ◯ **Masters degree + teaching experience**

PART B- ICT infrastructure, training, policy, community support, inadequcies

7 School ICT Infrastructure

7.1 In the 2013-2014 school year, how many of the devices below were used for educational purposes?

		Number
a	Desktop computer without internet access	
b	Desktop computer with internet access	
c	Laptop with internet connection	
d	Lapton without internet connection	
e	Mobile phone provided by the school	
f	Interactive/ smart whiteboard	
g	Digital camera	
h	Data projector	
i	Digital readers (portable device to read books, newspapers, etc. on screen) e.g. Amazon kindle	

7.2 Approximately, what proportion of this equipment (computers, interactive/ smart whiteboards, laptops, data projectors) is fully operational this 2015 school year?

(tick one box only)

Less than 50% ◯
50 - 75% ◯
76 - 90% ◯
More than 90% ◯

7.3 How many computers or laptops are installed for educational purposes for pupils to use either alone of with a teacher in the following learning spaces?

(fill in each row only using numbers- where there is no computer for educational purposes, just put '0')

		Number
a	**In computer laboratory**	
b	**In classrooms**	
c	**In the school library**	
d	**In other locations that are accessible to students in the school**	
e	**In other locatoin that are not accessible to the students in the school**	

7.4 By which of the following means does your school mainly have access to the Internet?

*(put **X** to any that apply)*

ADSL	☐	**3G**	☐
Satellite	☐	**Fibre optic**	☐
Wireless LAN	☐	**Wi-Fi**	☐

7.5 Who maintains the ICT equipment in your school?

*(use **X** to indicate your choise for each row)*	*yes*	*no*
The school's own staff	○	○
An external company contracted by the school	○	○
An external unit arranged by educational authorities (at local, regional level, etc.)	○	○
Other ()	○	○

7.6 During this school year (2013-2014), did your school have any of the following?

*(use **X** to indicate your choise for each row)*	*yes*	*no*
Its own homepage or website, publicly accessible	○	○
School email addresses for more than 50% of teachers	○	○

7.7 In the past two school years (2013-2014), what percentage of your teachers have undertaken professional development in the following?

*(use **X** to indicate your choise for each row)*	*None*	*25% or fewer*	*26-50%*	*more than 50%*
Introductory courses on internet use	○	○	○	○
Equipment specific training (interactive whiteboard, laptop, etc.)	○	○	○	○
Courses on the pedagogical use of ICT in teaching and learning	○	○	○	○
Courses on multimedia (using digital video, audio equipment, etc.)	○	○	○	○
Participation in peer learning communities or group work with other teachers about the use of ICT for learning and teaching	○	○	○	○
Other proffesional development opportunities related to ICT	○	○	○	○

7.8 Does your school have an ICT coordinator?

*(use **X** to indicate your choice)*	*yes*	*no*
My school has an ICT coordinator/ Computer Specialist	○	○
If yes, is this ICT coordinator/ Computer Specialist:		
(a) Available full time?	○	○
(b) Responsible for providing support on how to use ICT in teaching?	○	○

7.9 By ticking ONE response for each statement below, indicate how far your school's capacity to provide ICT-infused teaching and learning was affected by a shortage or inadequacy in the following areas:

*(use **X** to indicate your choise for each line)*	*A lot*	*A little*	*Not at all*
Number of computers	○	○	○
Number of Internet-connected computers	○	○	○
Internet bandwith or speed	○	○	○
Number of interactive/smart whiteboards	○	○	○
Number of laptops/notebooks	○	○	○
School computers out of date and/or needing repair	○	○	○
Teachers's ICT skills	○	○	○
Technical support for ICT used by teachers	○	○	○
Lack of support for teachers to use different teaching styles	○	○	○
Lack of content/material to use in teaching and learning	○	○	○
Lack of content/material in vernecular languages	○	○	○
Challenges with integrating ICT use into the curriculum	○	○	○
Lack of teaching models on how to use ICT for learning	○	○	○
School time organisation (fixed lessons time, etc.)	○	○	○
School space organisation (classroom size and furniture, etc.)	○	○	○
Pressure to prepare students exams and tests	○	○	○
Most parents not in favour of the use of ICT at school	○	○	○
Most teachers not in favour of the use of ICT at school	○	○	○
No or unclear benefit to use ICT for teaching	○	○	○
Using ICT in teaching and learning not being a goal in our school	○	○	○
School security concerns with theft of ICT hardware	○	○	○

7.10 **What level of benefit do you perceive the following ICT can have in your school to enhance computer-intergrated teaching and learning?**

(For each line choose one that mostly applies)

		Most beneficial	*Less beneficial*	*Least beneficial*
a	**Smart phone**	○	○	○
b	**Internet**	○	○	○
c	**Tablet e.g. Ipad**	○	○	○
d	**Interactive whiteboard**	○	○	○
e	**Educational software for learners with barriers**	○	○	○
f	**Computer (desktop)**	○	○	○
g	**Laptop**	○	○	○

8 School ICT Policy

(For each question, choose one response using **X** *that best describes your perception)*

8.1 **Does your school have an existing ICT policy?**

☐ **Yes** ☐ **No** ☐ **Partially**

If NO or PARTIALLY, please explain further or provide reasons for such

8.2 **Does your ICT policy specificy the use of ICT for teaching purposes?**

☐ **Yes** ☐ **No**

8.3 **Does your ICT policy specify the use of ICT for teaching learners with barriers / special needs**

☐ **Yes** ☐ **No** ☐ **Partially**

If NO or PARTIALLY, please explain further

8.4 **Does your ICT policy specify the use of ICT to provide learning for special needs learners?**

☐ **Yes** ☐ **No** ☐ **Partially**

Please explain your response further or give an example in the box below

8.5 **Is your school's ICT policy inclusive (caters for all types of learners)?**

☐ **Yes** ☐ **No** ☐ **Partially**

Please explain your response further or give an example in the box below

8.6 Does your school ICT policy specify the use of school ICT infrastructure for community support?

☐ Yes ☐ No ☐ Partially

Please explain your response or give an example in the box below

8.7 Does your school ICT policy specify the use of school ICT infrastructure for teacher Professional Development?

☐ Yes ☐ No ☐ Partially

Please explain your response or give an example in the box below

9 Community suppport

9.1 Is your school ICT infrastructure made available to the community for use after school hours?

☐ Yes ☐ No

If No, please give reason(s) in the box below

9.2 Would your school ICT infrastructure be made available after hours to support learners with barriers and special needs from your school?

☐ Yes ☐ No

Please explain your response in the box below

9.3 Would your school ICT infrastructure be made available after hours to support learners with barriers and special needs from the community?

☐ Yes ☐ No

Please explain your response in the box below

9.4 Would your school ICT infrastructure be made available after hours to support your educators? E.g ICT training, Professional Development relevant to the inclusive environment

☐ Yes ☐ No

Please explain your response in the box below

9.5 Which day(s) of the week could your school ICT infrastructure be used for community support?

Monday to Friday after school hours	☐	Alternate days of the week after school hours	☐
During school holidays	☐	Not at all	☐
Saturdays	☐	Other, please specify in the box below	☐

Please explain further in the box below

ANNEXURE F1: LANGUAGE EDITING CERTIFICATE

EDITING AND PROOFREADING CERTIFICATE

7542 Galangal Street

Lotus Gardens

Pretoria

0008

23 January 2019

TO WHOM IT MAY CONCERN

This certificate serves to confirm that I have edited and proofread CL Hlengwa's dissertation entitled, **"Towards ICT-enhanced Teaching and Learning in inclusive schools: A preliminary study in Johannesburg Central District".**

I found the work easy and intriguing to read. Much of my editing basically dealt with obstructionist technical aspects of language, which could have otherwise compromised smooth reading as well as the sense of the information being conveyed. I hope that the work will be found to be of an acceptable standard. I am a member of Professional Editors' Guild.

Hereunder are my particulars:

Jack Chokwe (Mr)

Contact numbers: 072 214 5489

jackchokwe@gmail.com

Professional EDITORS Guild

Open Rubric

ANNEXURE F2: LANGUAGE EDITING CERTIFICATE

EDITING AND PROOFREADING CERTIFICATE

7542 Galangal Street
Lotus Gardens
Pretoria
0008

09 March 2021

TO WHOM IT MAY CONCERN

This certificate serves to confirm that I have technical edited C Hlengwa's dissertation entitled, **"Towards ICT-enhanced teaching and learning in inclusive schools: a study in Johannesburg Central District."**

I found the work easy and intriguing to read. Much of my editing basically dealt with obstructionist technical aspects of language, which could have otherwise compromised smooth reading as well as the sense of the information being conveyed. I hope that the work will be found to be of an acceptable standard. I am a member of Professional Editors' Guild.

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Open Rubric

ANNEXURE F: Inclusive Schools ICT Policy Content Analysis

Criteria	Evaluation Question	Policy A	Policy B	Policy C
Name of policy / date of publication	What is the name of the policy?	Policy on the Use of Tablet devices and 3G/Wi-Fi connectivity supplied to schools in terms of the Gauteng Province e-Learning solutions programme Not dated. Policy provided by the service provider.	Guide on GautengOnline (GoL) code of ethics and conduct Not dated. Personalised and modified school policy	Computer Room Policy 24/04/2014. Generic policy provided by the Gauteng Province government department e-Learning directorate
Purpose	What is the purpose of the policy?	Guidelines on code of ethics and conduct for Gauteng Online. No outlined purpose of the policy		To promote an understanding of the new dispensation relating to the provision of ICT's to schools and assist SMTs, educators and learners to effectively manage and use the ICTs provided.
Implications on teaching	Does your ICT policy specify the use of ICT for teaching purposes?	The policy gives guidelines to how the computers and facilities are to be "used" i.e. universal service advancement of education. Users are learners, educators, SMTs etc. It is not explicit to the use of the infrastructure for teaching. Educators can use it for their personal advancement or development	It is used for educational purpose. Make learning easy and effective	Page 9 Point (b) Page 10 Point (a) English and mathematics subjects
Implications on teaching Special Needs Learners	Does your ICT policy specify the use of ICT for teaching learners with barriers / special needs	No. Not specified but rather a general learner/user classification	Teaching and learning for all-blanket statement	No. Blanket solution. The title says "e-learning solution." Used for priority grades and subjects

Implications on the learning of Special Needs Learners	What does the policy say about using school ICT in the learning of Special Needs Learners?	Silent	Silent	Teaching and learning for all- blanket statement
Implications on provision of Inclusive Education	What does the policy say about provision of all types of learners?	Not specified	Not specified. All learners page 11 point 11.7 (b)	Teaching and learning for all- blanket statement
Implications on provision of access to the community	Does your policy specify the use of school ICT infrastructure for community support and access? What are the guidelines for providing the community with access to learning resources	Agreement for other users of GoL "ABET learners, out of school youth, person who has received permission" page 6 point 5	No. Not provided for	No. Not provided for
Implications on provision of ICT infrastructure	How is the ICT infrastructure provided and supported by the school?	Service provider initiative. School has no direct bearing on ICT infrastructure provision	Not specified.	Page 6 and 7
Implications on ICT infrastructure maintenance	What are the guidelines for ICT infrastructure maintenance?	Service provider responsibility through the department of education	Department of Education responsibility	Page 10 point 11.6
Implications on teacher professional development	How is the school ICT infrastructure used for professional development?	Can be used for personal enhancement	Not specified	Not specified